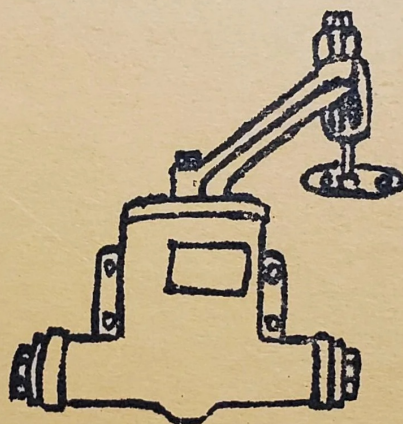


How to Repair Hydraulic Door Closers

By
W. M. Tucker



Introduction

This book is intended to teach the basic principles of standard hydraulic door closers, and how to adjust, maintain and repair them.

It does not attempt to describe every make and model in use, for it would take a very large and expensive book to do this and so much material would confuse the reader. Besides, as time passes, some models become obsolete and new ones are added.

By mastering the basic principles of overhauling closers, you will be able to take new models in your stride with little trouble.

The material offered here has been carefully selected to give you a wide range of construction and repair methods. After you become skilled with these closers you should be able to handle most closers regardless of make.

Door closers are used on doors in practically all large buildings, and on many small buildings. Many cities and states have laws requiring public buildings such as hotels, schools, and factories to have door closers on their doors for protection to keep fires from spreading.

The door closer keeps in the heat in winter and in summer it keeps in the cool air conditioned air. It keeps out wind and noise by keeping the door closed at all times.

You should visit some buildings that have door closers and observe how they operate, and how they are installed on the doors. See how large the closers are, and the size of the door. Note how fast they close the door, and observe the checking action.

You will find that almost all of them have the same general shape and operate in pretty much the same way. Observe as many closers as you can, so you will know exactly when a closer is adjusted right to do a good job. Probably some of those you observe will be out of adjustment or in need of repair.

You will soon learn to tell at a glance if a closer is working properly.

Schools, factories, hotels, office buildings, theaters and apartments all use door closers. Instructions in this book cover only the standard hydraulic surface type closers, since this is the type most used.

This book shows various methods you will need to know for general closer repair work, and you will find that it covers most of the problems you will encounter with any make or model of standard closers, in one part of the book or another.

We cannot answer individual questions concerning closers. The manufacturer of the closer can give you information concerning tools or parts for his own make of closer. You will find parts lists and names and addresses of manufacturers elsewhere in the book.

You should practice on one closer until you can take it apart and assemble it again quickly without hesitation. Then do the same with another make of closer. Soon you will become skilled and can handle most closers rapidly and with little difficulty. You can practice on either new or used closers. After you have become proficient, you can begin to do work for your customers.

Read the chapter on Building Your Business.

Function of The Door Closer

Of course the primary function of a door closer is to close the door, but it must do more than that. A simple spring would close the door.

A door closer must close the door gently but firmly. It must be able to close the door against the wind, but it must not slam when the wind is still. It must work well in freezing weather or during a heat wave. It must be adjustable to suit various doors, and not be cumbersome, and yet must be rugged enough to withstand continuous use over long periods of time, and not be too expensive.

That's a big order, but the hydraulic closer does all these things, and more. Even so, as time goes on, they require adjustments and repairs as is the case with all good machinery.

Some doors are larger than others and are harder to close than smaller doors. Metal doors are heavier than wood doors, so closers are made in various sizes in order to furnish closers of proper strength for any door, but the small closers and large ones are similar in construction except for size, strength and weight.

The door closer forces the door to close again after being opened, but at the same time it checks the closing speed to any speed you desire, so the door will close gently and quietly without slamming. It helps keep heat in the building in winter and keeps cool air in when air conditioned in summer. It helps keep out rain and dust and prevents spread of fires in buildings by keeping doors closed at all times.

How The Closer Works

The principle of the hydraulic closer is the same, regardless of make, shape or size.

A metal case or shell contains the inner works and the hydraulic oil. A metal arm with an elbow joint projects out from the top of the case.

The closer case is usually fastened to the door with screws, near the top of the door. The closer arm of course is fastened to the top of the closer at one end, while the far end of the arm is attached to the door frame with screws, just above the door. The closer is attached to the door. The end of the closer arm is attached to the door frame, above door.

When the door is pushed open it moves the arm. The arm is fastened to a shaft or spindle extending down into the closer, all the way to the bottom. When the arm moves, of course it makes the shaft turn. When the shaft turns, it causes the spring inside the closer to wind.

The lower end of the shaft is connected to a piston inside the closer. As the shaft turns and winds the spring, it also pulls the piston backward through the hydraulic oil in the closer, a ball valve in the piston opens and allows the piston to move backward through the oil without pressure or suction.

After the door is opened and released, the spring unwinds, rotating the shaft backward in the other direction. Since the arm is fastened to the top of this shaft, this causes the arm to move also, and forces the door to close again.

Since the bottom of the shaft is linked to the piston, as the spring unwinds and rotates the shaft, it also forces the piston to move forward

again, pumping against the oil. As the piston moves forward, the ball valve closes in the piston, and the piston cannot move through the oil now without meeting pressure.

As the piston moves forward it pumps the oil out of the piston chamber through a small hole called the escape hole, or port. The size of this hole can be made larger or smaller by screwing in the valve screw (outside the closer case). The end of the valve screw extends into the escape port and the hole can be closed or opened to any extent simply by screwing the valve screw in or out a little.

If the escape hole, or port, is open, the oil is pumped through it rapidly as the piston moves forward, but as the adjusting valve screw is screwed in, the escape port is blocked, or partially blocked, and the oil can only flow through at a slow rate of speed. The piston can move only as fast as the oil is permitted to flow through the escape port. The arm of closer moves with the piston, and since the arm makes the door close, the closing speed of the door can be adjusted to any desired speed simply by turning the adjusting valve screw in or out.

To sum it up, when the door is pushed open the closer arm causes the spring to wind and the piston to move backward without pressure, through the hydraulic oil. The ball valve in the face of the piston opens as the piston moves backward, letting the piston move through the oil without pressure.

When the door is released, the spring unwinds, moving the arm back and closing the door. The piston also moves forward again, and as it moves forward, the oil makes the ball valve close, making the piston push against the oil with pressure. The piston now is pumping the oil out of the chamber through the escape port. The oil goes around and flows back into the chamber, behind the piston. When door is opened again, the piston ball valve opens, and when the piston moves backward the oil again is in front of the piston, ready to be pumped out again through the port when door closes and piston moves forward with closed ball valve.

Turning the adjusting valve screw in or out opens or closes the port, regulating the flow of oil, controlling the closing speed of door. Most closers have two regulating valves instead of one. This allows the door to close at a medium speed until it is almost closed. This is called the closing speed. When the edge of the door is about four to six inches from being completely closed, the speed changes, and the door closes the rest of the way gently and slowly. The door closes relatively fast till almost closed, then slows and closes gently. This last speed is called the latching speed.

This two speed closing is done by two oil escape ports. As the piston moves forward, it goes faster as the oil flows out through two ports. But one hole is placed nearer to the piston than the other, so when the piston moves forward enough to cover this first escape port, the oil then pumps through only the other escape port, and moves at a slower speed.

The size of both these escape ports is controlled from the outside by regulating screws. Usually, turning the adjusting screw left increases the closing speed, and turning right decreases the speed. The same applies to latching speed. Turn the latching screw left or right to change speed.

You will find variations in various closers. Sometimes you will need to turn a knurled nut with your fingers to adjust the latching speed. Sometimes the speed is controlled by a flat place on the stem of the regulating valve. See instructions under assembling directions for various closers. In any case, when in doubt, a few turns by trial and error will soon show you how the valves are adjusted on any closer. In some closers there is a V groove at bottom of piston to allow some oil to go through piston till piston is almost to end of pumping stroke. Then oil quits flowing and latching speed is slower.

Yale

First remove the name plate from the front of the closer. This brass name plate is held on with two small rivets or screws. Knock off the heads of the rivets with a chisel and the plate will come off. Turn the valve screw all the way in to prevent the oil from flowing.

With your ratchet wrench, wind the ratchet around a little tighter, just enough to allow you to push the pawl out of the notch in the ratchet. The pawl, remember, is attached to the arm. Now let the ratchet unwind slowly till the spring is unwound completely. Then remove the nut over the main arm, and lift off the arm. Loosen the clamp screw in the main arm first. If the arm is stuck on the spindle, pry it up gently with a screwdriver.

When winding or unwinding the ratchet of any closer, use extreme caution, for if your wrench should slip, the ratchet would spin around and if your finger was in the way the revolving slots could seriously injure you. Always unwind the ratchet to release spring tension before you attempt to take the arm and cover off any closer, and always keep your fingers away from the ratchet while there is spring tension.

Place the closer in your bench vise with the front of the closer facing you. Tighten the vise firmly, but not enough to crack the case of the closer, and with an ordinary wrench remove the top nut which holds on the arm of the closer, and loosen the clamp screw in the arm. Lift off the arm. Then lift off the ratchet, which is a round disc with slots cut in the edge.

Next remove the closer cover. Take a hammer and a flat end punch or a blunt screwdriver and tap upward at different spots around the cover, moving one side up a little, then the other.

This cap is pressed down tightly on the closer like the lid on a tin coffee can. Do not hit the cap hard enough to damage it, for the cover and the case will both break or crack if you hit them too hard, especially in cold weather.

After the cover is removed you can see the spring and top spring plate. With a screwdriver lift the top spring plate a little to release any remaining spring tension. Watch your fingers. Insert ratchet and wind spring a little, to ease tension while lifting plate.

Now lift out the spring and the top and bottom spring plates, and the driver.

The end cap is actually a plug screwed into the end of the closer, and the outer part of the cap is shaped like a large nut and you can unscrew this end cap to the left and remove it. You can get an end cap wrench for this purpose, but perhaps a stillson wrench is better, for usually these end caps are hard to unscrew, and you can put a length of pipe

over the end of a stillson, getting a longer handle and more leverage.

The cap you remove is the one opposite the end with the adjusting valves, so remove the plain cap, not the one where the valve screws are located. Both ends are nut shaped, but only the left hand cap is threaded and removable. However, in a few makes of closers you will find that both caps are removable, but in ordinary repair work you will only need to remove the one cap anyway, regardless.

After you remove the end cap, allow the hydraulic oil, called hydraulic fluid to drain out. Put a bucket or other container under the closer to catch the oil. Set the arm back on the closer shaft and move it left and right. This will cause the piston to help pump the fluid out. Remove all the fluid and discard it. Do not use it again. Always put in new fluid when you assemble the closer again. When I use the word oil, or hydraulic fluid, I do not mean ordinary oil, but refer to special door closer hydraulic fluid, often called oil.

When all of the fluid is out, take a packing nut wrench and remove the shaft packing nut. Unscrew to left. This is the small nut at the top of the gland and it holds the leather packing washers in tightly packed position. Remove the metal washer from the top, then remove the leather packing washers. Use a sharp pointed ice pick or knife blade to lift out the four leather washers. If you tear them up in the process, it doesn't matter. Do not try to use these packing washers again in any case. Use new ones when you assemble closers again. Instead of four packing washers, some closers use only one special sealing washer, called an "O" ring.

Now, using an adaptor, remove the large combination packing nut (In some closers this would be called the packing gland.) The packing nut has a wide circular base, threaded around the outer edge and this is screwed firmly into corresponding threads in the closer case. This packing nut and base seals off the upper spring chamber from the lower fluid and piston compartment.

The center upright gland or barrel is hollow inside to permit the shaft to go through from the piston chamber up to the top of the closer, where the main arm is fastened to the shaft. But the leather packing washers, tightly packed around the shaft (in the gland) prevent the hydraulic oil from escaping upward through the shaft hole and into the spring compartment.

So, I repeat, this packing nut (gland) with its base, seals off the spring compartment from the fluid and piston compartment, and acts as a shaft bearing.

The large circular base of the packing nut has three shallow holes cut into the top face. These holes do not go through the metal, but are only indented in the base, to enable you to use the adapter to unscrew the packing nut from the floor of the spring compartment. The packing nut adaptor has a large hole in the center so you can slip it down over the packing nut easily.

The bottom of the adaptor has three heavy short projecting pins which will exactly fit down into the three indented holes in the base of the packing nut. The top portion of the adaptor is shaped like a big nut. The hollow packing nut wrench will exactly fit over the nut shaped top of the adaptor. The packing nut wrench has a strong rod handle running through it to enable you to obtain strong turning leverage. Turn left, just

as you would unscrew any nut and unscrew the packing nut from the floor of the spring compartment

Sometimes the packing nut will be stuck fast in the threads, and cause the pins of the adaptor to jump out of the holes in the packing nut base when you turn hard. In this case you must use a special steel sleeve to hold the adaptor down as you turn. Place a large washer on top of the adaptor. Push the pipe-like sleeve down over the shaft until it rests on top of the washer.

The sleeve must extend up to the middle section of the shaft threads. If it doesn't extend high enough to reach the threads, use another length of sleeve. Place the main arm nut on top of the shaft and tighten it down firmly against the sleeve. This will hold down the sleeve and of course it will also hold down the adaptor against the base of the combination packing nut. Now you can unscrew the packing nut without having the adaptor slipping up off the base of the packing nut.

Use your packing nut wrench to unscrew the packing nut. The packing nut wrench is a large socket wrench which fits down over the nut shaped top of the adaptor.

After you unscrew and remove the packing nut, you can lift the crankshaft and piston right up through the top of the closer. The piston is fastened by a pin to a short connecting rod.

Now remove the regulating valve assembly from end of closer, by unscrewing the brass nut and pulling out the valve assembly carefully.

You have completely disassembled the closer. Next you should inspect all the parts for signs of wear or damage. Worn or broken parts should be replaced with new parts or used parts in good condition. For more instructions on this, read the chapter on General Repairs.

Unless the closer is perfectly clean, and you have taken it apart to simply replace a certain part, all the parts of the closer, including the case, must be cleaned thoroughly before you reassemble the closer. This is a must, and in almost every case you will have to clean the parts or the closer will not work properly after assembly.

Usually a good cleaning job, with new fluid and new packing washers will be all that is required. Sometimes you will have to replace a worn or broken part also. In a few cases the closer will be clean and have tight packing, but may need a new spring. In this case replace the broken spring and do not disturb the rest of the closer.

For cleaning instructions, read the chapter on Cleaning.

When you are ready to assemble the closer again, you simply reverse the procedure you used in taking the closer apart.

Insert piston and crankshaft assembly. Screw the packing nut firmly into place, but first take a small paint brush and put a film of white lead on the threads to seal them tight when screwed into place. Or you may use a special thread sealing compound. Remember, lead is poisonous, so avoid breathing lead compound fumes, or handling with bare hands. Sealing prevents leakage.

You should also seal the threads of the end cap and the valve assembly nut threads to avoid any chance of fluid seeping out, and prevent corrosion of the threads.

After screwing in the packing nut, insert the packing washers. It is of extreme importance to repack these leather washers correctly, for

if you don't, the hydraulic oil will leak out past the packing washers and nut, and get into the spring compartment. Loss of oil from the piston chamber will interfere with checking action. Do the job right at first and you won't have to do it over later. Three leather packing washers (sometimes four) will do the job. To put a washer in place, slip it on over the top of the shaft, then push it down the shaft and into the gland. Then with the ramming tool, which is a round metal tube the size of the washers, tamp the washer down tightly into the gland. The first washer will go down to the bottom of gland. Now insert the second leather washer and tamp it down with the ramming tool.

Place the ramming tube over the shaft and let the bottom end rest on top of the washers, with a hammer, tap lightly on top of the ramming tube, and it will compress the washers flat and tight, down in the gland. Then do the same with your third washer (and if you have to use four washers, do the same with the fourth washer).

Now you have all the packing washers stacked on top of each other and rammed down to a tight compressed fit, in order to prevent the hydraulic fluid from leaking up along the shaft from the piston chamber and into the spring chamber. Now on top of the leather washers, place the metal washer, with concave side down, and ram it down firmly.

Now place the shaft packing retaining nut on top of the metal washer. Screw it down medium tight. This will hold the packing washers compressed and in place. If you find a closer using only one packing washer called an "O" ring, do not ram it into place.

Place arm on the shaft and move arm left and right a number of times to help seat the leather packing washers. Then tighten the packing retaining nut again. This should be repeated several times until you are sure the packing is settled completely. You may find that washers are made of some other material than leather, in some cases.

Next, replace the spring and its assembly. While spring is upright on your bench, fasten the bottom plate on the spring at top. Snap the plate into place. The hook on end of spring must fit snugly into the notch in the plate. You may need to take a hammer and tap the plate down till it snaps into place. Place spring hook into plate notch first, then tap other end of plate down.

Insert the spring in closer with bottom plate down and slip the driver on over the shaft and let it drop to bottom of spring. Now place the top plate on the upper part of spring in the same way you snapped on the bottom plate. Hold screwdriver blade under third coil of spring and push upward as you put on top plate, to brace it.

Put some cup grease or other grease on the spring coils. Put the ratchet on over the shaft. With your ratchet wrench, engage the ratchet and turn left, lifting the plate slightly at the same time to allow the notch in the top plate to pass over the projection in the inner top edge of the case. When the plate notch is directly past this projection push the plate down until the notch engages the projection in the rim of the case.

The spring and plates are now fastened properly in the closer. Do not proceed further until you completely master this operation. With practice you can do this quickly and perfectly. If you do not install the

spring and plates properly, the the closer will not work.

Lift off the ratchet and put the cover on the case. Tap it down firmly with a hammer. Put on the ratchet. Ratchet teeth must point toward the back of the closer. Put on the main arm. Be sure to replace main arm on shaft in the same position as it was when you took it off. By observing things like this as you take the closer apart, you will avoid needless delays when you put the closer together again. On some closers you will see an arrow stamped on the shaft, and the letters A, B and C stamped on the main arm. If you place arm on shaft with arrow pointing to A, the closer will silently release checking action at latch point. If arrow points to B, this is for closing of right hand doors. If closer is mounted on bracket, B is for left hand doors and C is for right hand doors. On regular closers the arm will usually only go on the shaft one way.

A good system is to file a notch on the arm before you remove it, then you can put it back in the same position without hesitation when you assemble the closer again. On many closers the arm will only fit on the shaft in one way, due to shape of shaft top.

Now place the closer in vise with the open end up. The end cap is still off. Then slowly pour in new door closer fluid. Use the main arm to pump the piston gently to allow the air bubbles to rise and escape. Fill until the fluid is no more than 1/4 inch from the top of the rim.

Paint the end cap threads with white lead, or some other thread sealing compound. Screw in the end cap. If the end cap had a sealing washer, replace it with a new one. Screw the end cap in tightly to avoid leakage.

With your ratchet spanner wrench, wind the ratchet until spring is tight enough to close door properly. Push the pawl into place as you try different settings of tension.

Usually about two or three notches is enough, dependnig on the door. The pawl, of course, prevents the ratchet from turning backward and letting the spring unwind. The pawl point fits into whichever notch is turned to line up with the pawl. Do not tighten spring more than is necessary, for it will make door harder to open, and increase chance of breaking the spring when door is shoved open.

You are now ready to adjust the regulating valves, which control the closing speed.

On screen door closers the valve is upright or vertical. This vertical valve has only one speed adjustment — the closing speed. Latching speed is regulated by changing the position of the main arm on the shaft.

Other closers have the horizontal type valve. The horizontal valve has two adjustments. Full turns of the screw regulate the closing speed. The latching speed is regulated by turning the adjusting screw partly to the left.

Squirt a little heavy weight motor oil on the arm and ratchet bearings. Now you are finished, but if you are doing the job in a public shop, you will probably want to paint the closer. Usually you can use your own choice of paint color, unless the customer desires some certain color. You can use a paint brush or spray gun. Use brown enamel, gray enamel, aluminum or bronze color, or whatever you think is best. Do not let paint get into arm joints or ratchet bearings. After the paint dries, replace the brass nameplate with sheet metal screws.

If you find that some part is frozen and cannot be removed without breakage, try boiling the closer with fluid removed, for a little while. This heats the parts and removes gum and sludge. Then try to remove the part. Sometimes you may have to use a torch, or a small canned gas torch, to heat the part. Remember, the fluid may burn, explode or turn to steam and blow up if heated. You repair closers at your own risk, so always be careful to avoid accidents. Remove fluid first, and be sure there is plenty of fresh air in the closer, and no trapped oil fumes. Boiling is safe, provided the fluid is removed first. Use open flames with great caution. Also avoid overheating, or you may warp or damage the case with an open flame. This applies to all closers.

You will find that most of the Yale closers use helical type springs, and are universal. That is, they can be used on either left or right hand doors without removing the spring.

This is accomplished by use of the spring plates and driver (middle dog). The spring has a plate fastened to the bottom and one fastened to the top. The driver is inside the spring and extends from the bottom plate to the top plate. It is free to rotate left or right.

The upper part of the driver extends up through the closer cover, and the ratchet fits down over this top portion of the driver. The crankshaft of course goes all the way through both plates and the spring and the driver and extends a little above the top of the ratchet and driver. The main arm is fastened to the top of the shaft.

Now the pawl on the main arm catches in one of the notches of the ratchet, so, when the arm moves, the ratchet moves too. The ratchet is attached to the top of the driver, so when the ratchet moves, the driver moves. The driver can rotate freely for a partial turn either left or right. If it moves one way, it hits a lug projecting down from the top plate, so the top plate now rotates with the driver. The top plate being attached to the spring, winds the spring from the top. The bottom plate cannot move in this direction since it hits a projection in the case. Thus, the spring winds from the top and makes spring tension.

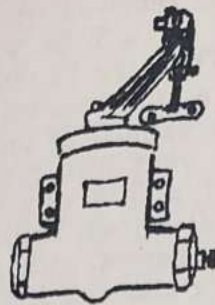
When the main arm moves in the other direction, the driver moves in that direction too. This time the driver moves away from the lug on the top plate. The bottom of the driver, however hits a lug on the bottom plate, and the bottom plate rotates the same direction as the driver.

This winds the spring from the bottom, since the bottom plate is attached to the bottom of the spring. The top plate cannot turn in this direction, since it hits a projection in the case. So the spring winds from the bottom this time. When the main arm is released, the spring unwinds, moving the arm back straight out again, closing the door.

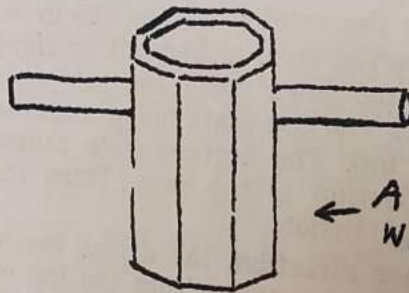
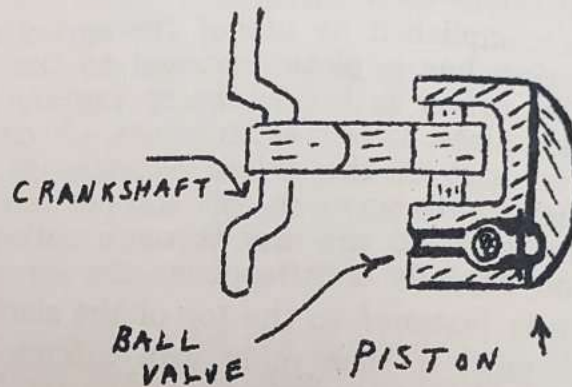
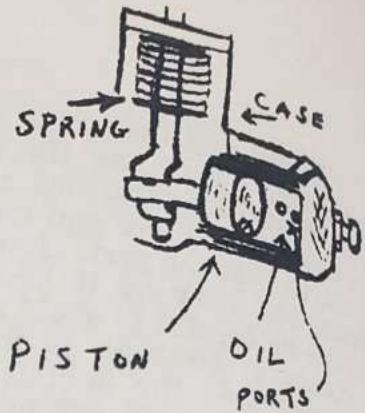
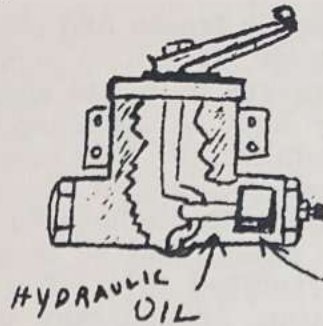
To change the hand of this type closer, simply wind the ratchet left or right as desired, using your ratchet wrench. Then push the pawl (of the arm) into the notch of the ratchet that is lined up even with the pawl. Now the arm is connected with the ratchet. The job is done.

Of course closers using the clock type spring do not use the top and bottom spring plates, and no driver. The ratchet has a long tube or sleeve extending down into the spring and hooks directly to the inner end of the spring. It will wind only one way. To reverse it, simply turn the spring over.

YALE



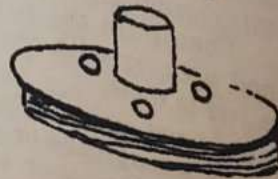
COMPLETE
CLOSER
MOUNTED ON DOOR



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WRENCH

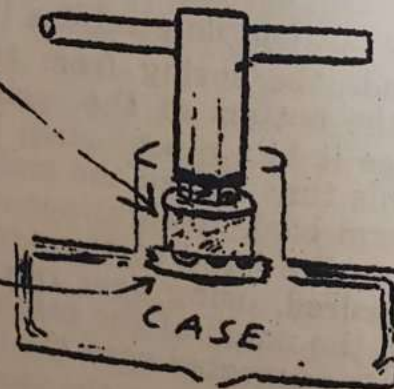


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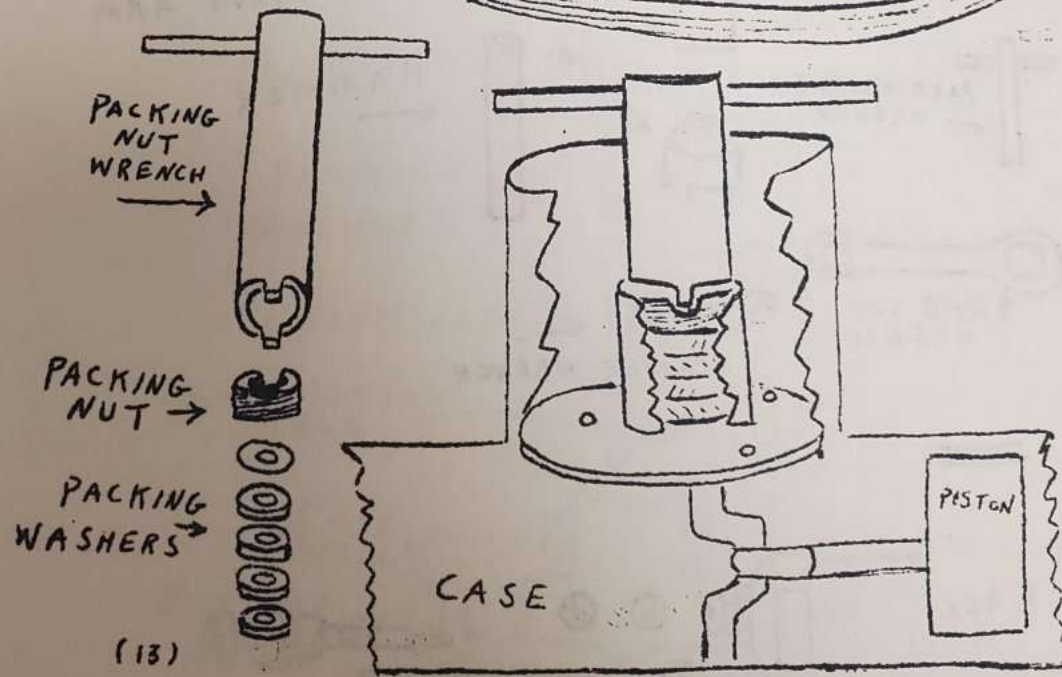
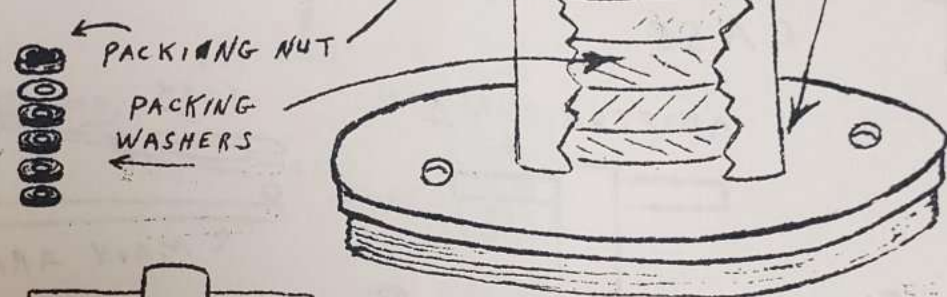
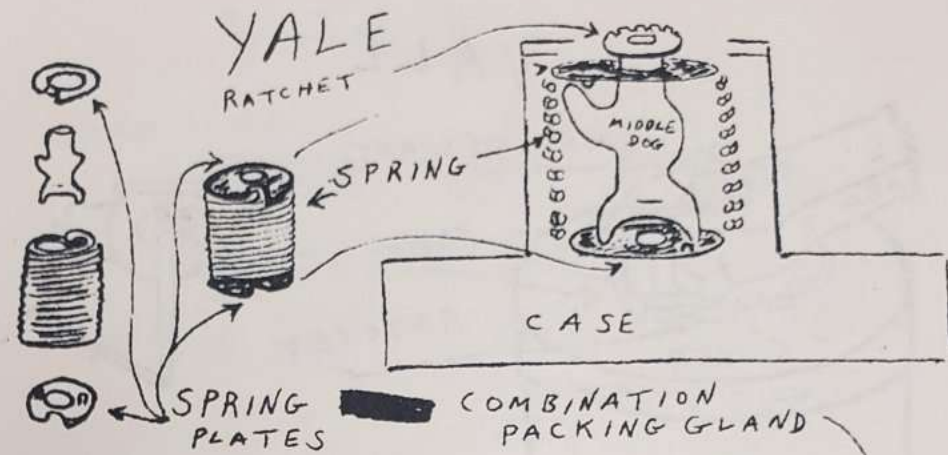


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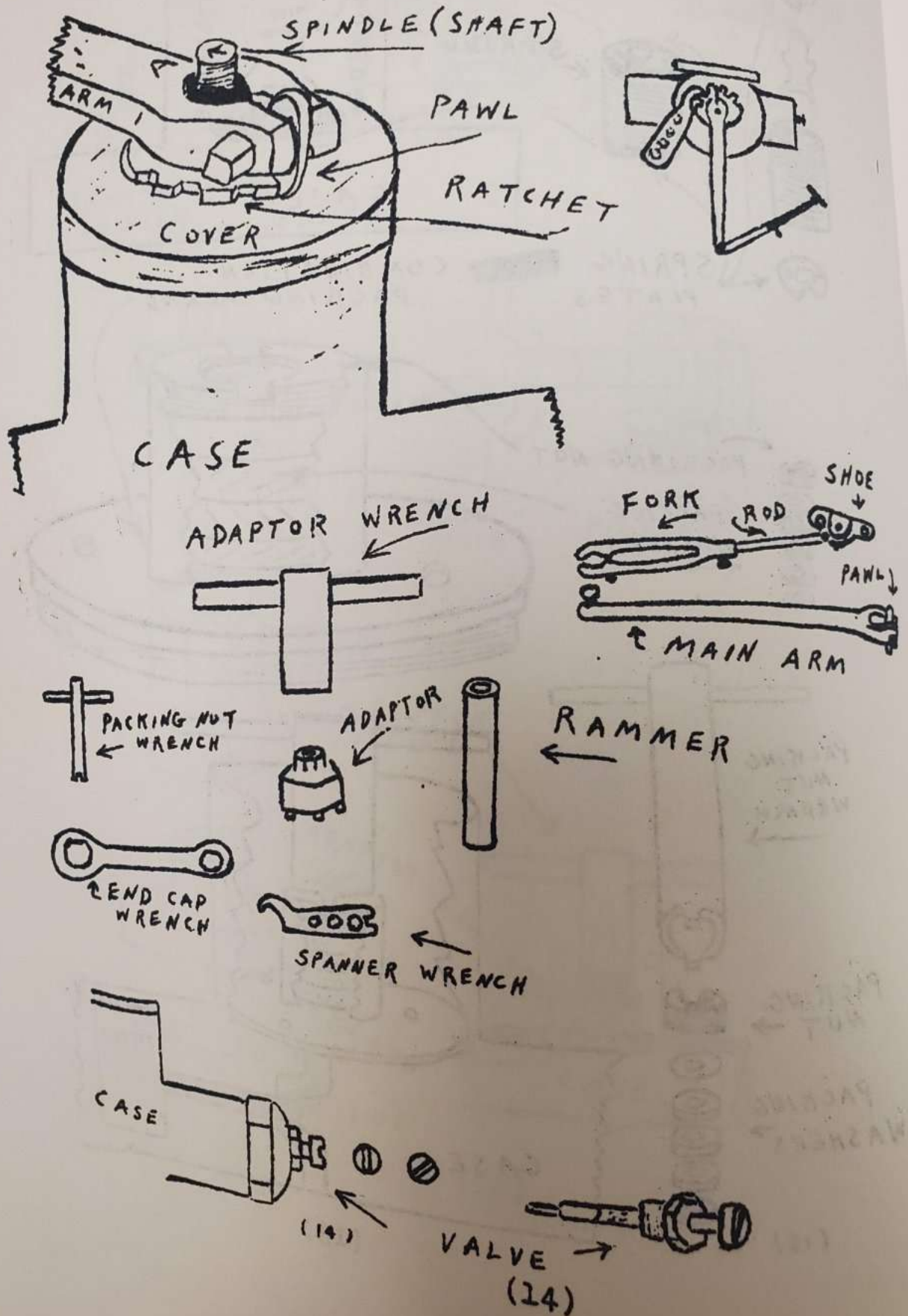
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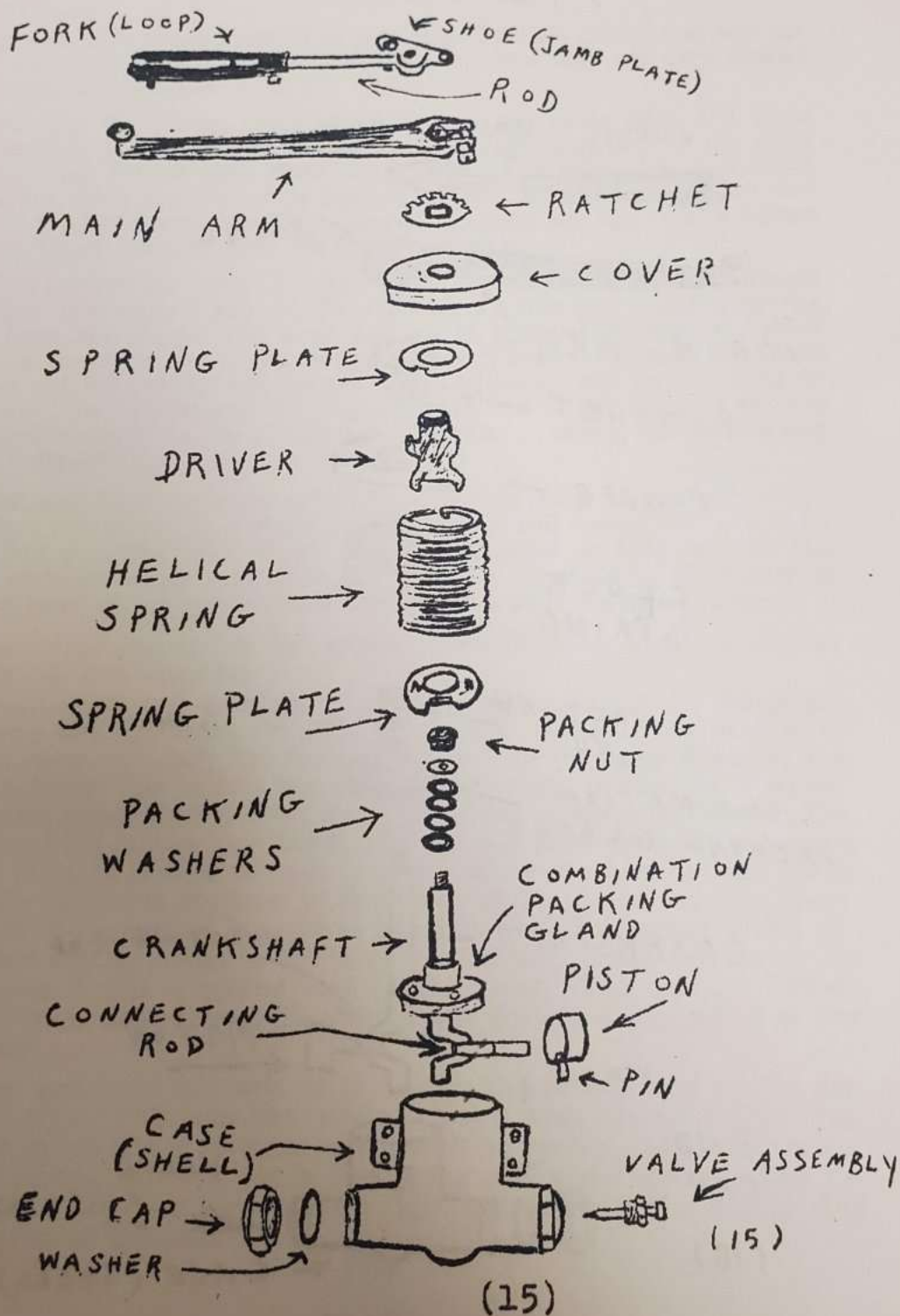
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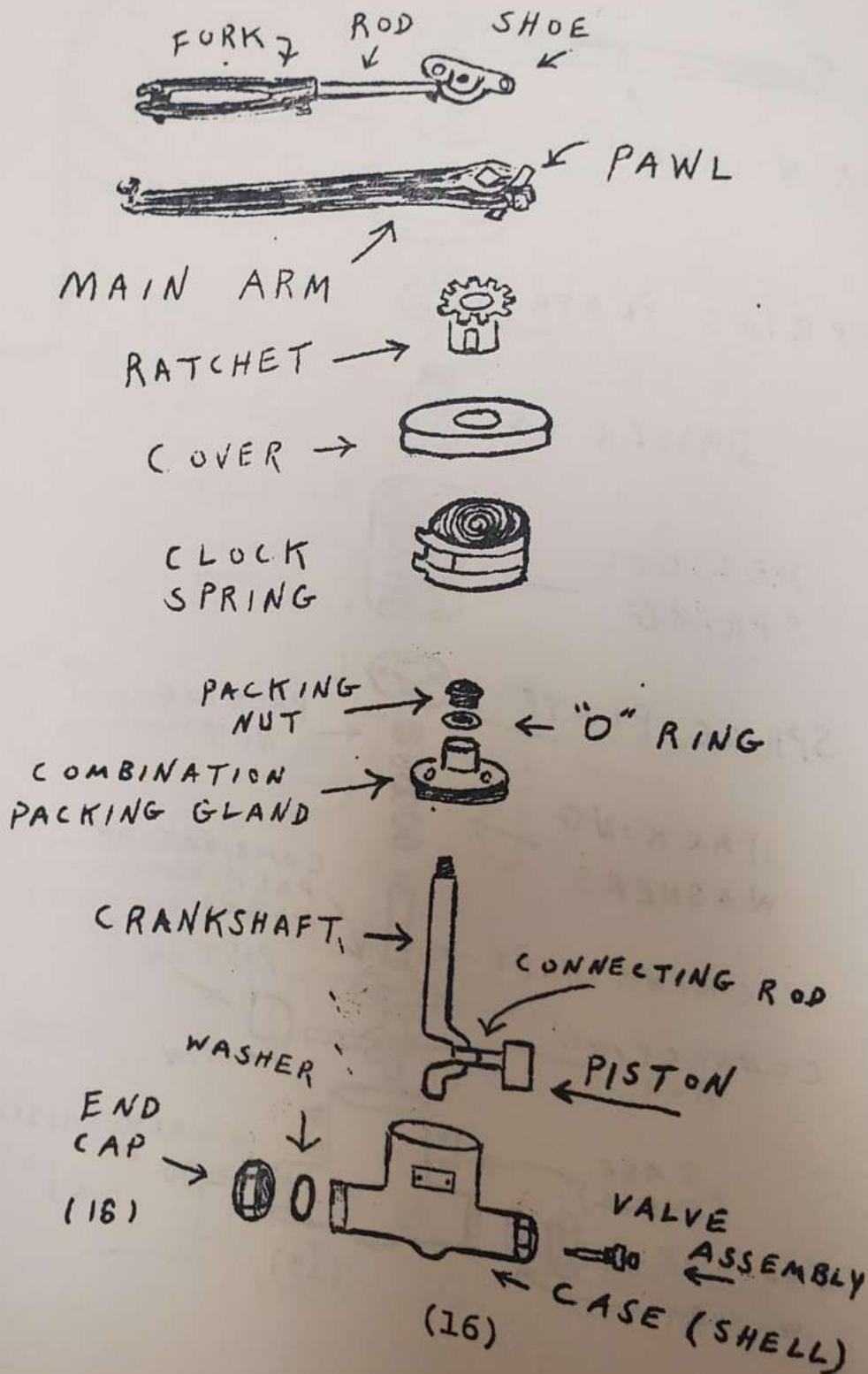
YALE



YALE



YALE



Corbin

The Yale closer previously discussed was a crankshaft type closer, while the Corbin closer uses the rack and pinion. The piston is moved by gear teeth.

If you have become skilled in servicing the Yale closer, you will not have much difficulty with the Corbin closer, since they are very similar in general construction.

To take the Corbin closer apart remove the name plate and place the closer in your bench vise. It should be upright, with top up, main arm pointing toward you. Have closer tilted a little so you can drain the oil out when you eventually remove the end cap. Remove top nut and take off the main arm. You must loosen the clamp nut on the arm before you can lift off the arm from the spindle (shaft).

Now remove the cover from the top of the closer. Tap upward around the edge. The ratchet and middle dog and top dog are fastened to the cover from the inside. You must not try to remove the ratchet before removing the cover, for if you do the cover will break. Remove the cover and lift out the spring and bottom dog. Ordinarily you do not need to take apart the ratchet and top dog assembly, but if you do, just remove the machine screws in the middle dog. The ratchet, cover, and middle dog are all fastened together in one assembly.

Now you must study the spring assembly carefully so you will understand how it works. This closer has the helical coil spring and works on either left or right hand doors without reversing or turning over the spring, as is necessary with clock spring closers. In other words, the main arm will have spring action either left or right with the helical spring.

The helical coil spring has spring action in either direction due to action of the dog assembly.

Imagine you are standing in front of closer, facing it. When the arm moves left, of course the pawl is engaged in one of the notches in the ratchet, so naturally the ratchet will turn in the same direction the arm is moving. The middle dog is fastened to the ratchet so it moves in the same direction too. Since this middle dog is centered between the top dog and the bottom dog, the middle dog will push against the bottom dog and make it revolve to your left also. Since the hook on the lower end of the spring is fastened in the notch of the lower dog, the lower dog winds the spring as it revolves and this gives the spring action desired when arm is moved to the left. The top dog cannot revolve to the left because it hits a special stud in the cover. (The top and bottom dogs in Corbin closers resemble the top and bottom spring plates of the Yale closers.)

When you move the arm to the right, the ratchet and middle dog also move right. This time the middle dog will push against the top dog. The notch in top dog is fastened to the hook on the top end of the spring, so the revolving top dog winds the spring and gives spring action desired. The bottom dog cannot move right because it hits a special stud in the bottom of the case.

In other words, when the arm moves to the left the middle dog rotates left and pushes the lower dog and winds the spring from the bottom. But when the arm moves to the right, the middle dog rotates to the right and pushes the top dog around, winding the spring from the top. This permits you to use the closer on a door swinging left or right without reversing the spring. It is only necessary to wind the ratchet left or right, as the case may be, using your ratchet spanner wrench. Then when you have the desired spring tension, push the pawl down into whichever ratchet notch is lined up even with the pawl. Now disengage the spanner wrench. Main arm is now connected to ratchet and spring assembly.

We'll get back to taking closer apart. Remove main arm and pawl. Then remove cover and ratchet and dog assembly together. Do not try to remove ratchet while cover is on the closer. Lift out spring and bottom dog. Remove the end cap with your stillson wrench and drain the hydraulic fluid out. Discard the old fluid. Unscrew the packing nut with your packing nut wrench. Remove the metal washer and if there is a packing nut spring remove it too. Then remove the leather packing washers with an ice pick or knife blade. Take your gland wrench and unscrew the gland to the left. Remove it. Lift out the spindle from the closer. (The spindle is often called the shaft). Now take out the rack and pinion through the end of shell where you removed the cap.

In some cases the piston may be corroded and stuck. Do not force it enough to damage the cylinder walls, which must be perfectly smooth. Use a hook to pull the piston out. If it is stuck fast, boil in your vat of cleaning solution for a few minutes to dissolve the gummy corrosion. Then remove the piston and rack through the end of closer.

Unscrew the upper regulating valve packing nut. Pull out gently as you screw out the valve shaft which is threaded. This avoids stripping the threads against the small steel packing washer. The lower valve can be removed by unscrewing the nut and pulling out, for the lower valve shaft has no threads.

If necessary the valve packing can be replaced, but perhaps it is best to replace the whole valve assembly unit. Especially at first until you become skilled at repairing closers.

In some closers the rack and piston are made all in one piece, while in others the piston is attached to the end of the rack with a screw. Do not remove piston from rack unless it is damaged and must be replaced.

To remove the piston from the rack, just take out the screw, never place the piston in a vise, or it may become scarred and useless. And do not polish the piston with a wire brush on a motor, as you do the other parts. This may wear down the surface of the piston slightly and cause loss of compression, or the piston may not move smoothly in the cylinder.

Now place the parts in your cleaning basket and boil them in your vat of cleaning solution the same way you clean the parts for other closers. See the chapter on Cleaning Closers.

To assemble the closer again, simply use the reverse procedure of taking it apart. Place closer in vise, top up, and front toward you.

Insert rack and piston in the closer through the open end of closer. The piston end must enter first and face the valve end of closer. Push in as far as piston will go. Some models have an oil escape groove cut in the piston. This groove will be down at the bottom.

Replace the spindle by inserting from top of closer, with pinion teeth down. Be sure that the teeth of the pinion mesh properly with the teeth in the rack. If meshed properly you can turn the spindle all the way around and the piston will move forward and backward continuously as you turn the spindle. Test this before going further.

Now screw in the packing gland with the gland wrench. First paint the threads with white lead sealer. Then repack the gland with new leather packing washers. Do not use old washers again. Push washers down over the spindle and down into the gland. Use gland packing compressor tool to tamp down the washers one by one.

This pipe like tool will slide over the spindle and down against the packing washers. Tap the tool with a hammer and compress the washers gently and firmly in place. They must be tight. This is sometimes called a ramming tool. Whether you use cork washers, leather, or fibre, they must be packed tightly enough to avoid leakage. This is a critical point in repairing all closers. See that you master this procedure. Ram each washer as you replace it, then ram all together. Do not crush the washers. Some closers require three washers, Some use four. You can tell when your packing is at the proper level. Put on the top metal washer. If there is a packing spring replace it too. Put on the packing nut and tighten it.

As you did with the Yale closer, put on the arm and swing it left and right a number of times and then tighten the packing nut again. Repeat until you are sure packing washers have settled completely.

Now replace the spring and dog assembly. Place the bottom dog on the floor of the spring chamber, and rotate the dog to the left until it stops. Insert the spring, either end down, so that the hooked end of the spring will fasten in the notch of the bottom dog.

Incidentally, the bottom dog is the same shape as the top dog.

If you took the middle dog assembly loose for any reason, remember that you must put it back with the projecting part of the middle dog pointing in the same direction as the four teeth in the ratchet.

Replace the ratchet assembly and cover on the closer. Turn ratchet left far as it will go. See that small hole in side of cover is pointed toward front of closer as you place cover on closer. Sleeve of ratchet will go down over the spindle. Now lower the cover and dog assembly until top of ratchet is just even with top of spindle, then you can turn the cover and ratchet to the left without binding on the closer case. With your spanner wrench, turn ratchet and cover to left, but be sure the cover is held just above the rim of the top of closer, or it will not turn freely. If you lower the cover too much it will bind.

Turn ratchet to left until you feel spring tension. At this point the ratchet teeth should be pointing to the left. Now turn cover to the left until you feel spring tension. Using your ratchet spanner wrench, turn the ratchet to left against the spring tension until its four teeth face the front of closer, and turn cover to left until the small hole is exactly over the small pin projecting up from the top of the rim of closer case.

Tap the cover down firmly, and the pin projecting up from the closer will now be projecting up through the hole in the cover. This pin keeps the cover from turning around after it is in the closer case.

Since you removed the regulating valves for cleaning, replace them after painting the threads with white lead sealer.

Slip the main arm over the spindle and move left and right to see if you have replaced the spring, cover and dog assembly correctly. Wind the spring a little with your ratchet spanner wrench, and push the pawl into one of the ratchet notches. Test for spring tension by moving arm. Do not let the arm slip from your grasp and snap around, for there is no fluid in the closer and therefore no resistance to the spring. The spring may break if it snaps around suddenly.

Now that you are sure you have placed the cover and spring and dog assembly back correctly, turn the open end of the closer upward in the bench vise and slowly pour in the new hydraulic oil. Move the closer arm slowly up and down so the piston will move in the fluid and make the fluid circulate to all parts. Air bubbles will be forced to the top. Fill the closer until the oil is exactly even with the rim of the end of the case so that no air will remain in the closer.

Screw the end cap on tight, first painting the threads with a thin coat of white lead to seal them. If there was a washer under the end cap when you removed it, replace it with a new washer. Some models use a washer under the end cap to act as a gasket, and some models do not use the washer.

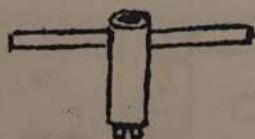
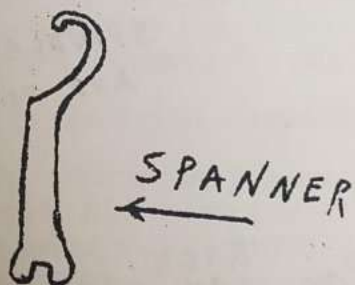
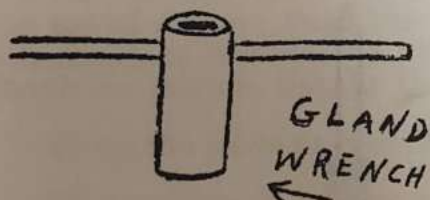
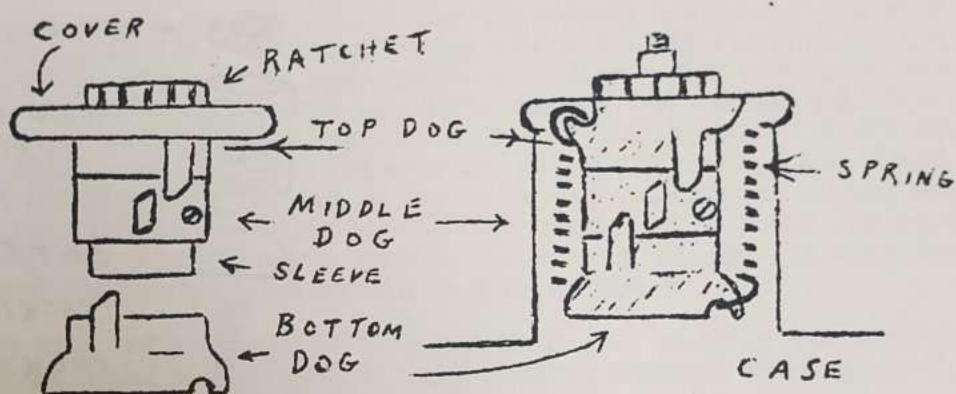
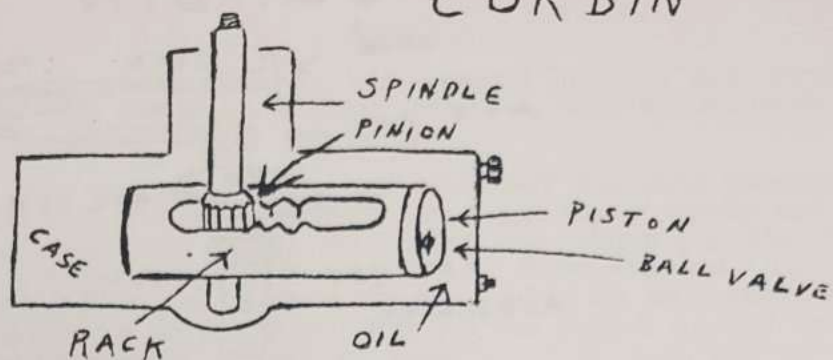
In some closers you may find that the end opposite the removable end cap will have a large screw. This is called the filling screw, and in cases where you don't take the closer apart for cleaning and just want to add some fluid, you can remove this screw and slowly pour in the fluid through this hole. This end must be placed upward in the vise, of course. Fill with oil up to the rim and work the arm up and down to make air bubbles rise to the surface and escape.

If you have taken the closer apart for cleaning, pour the fluid in through the open end as previously described.

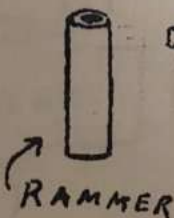
Be sure to screw end cap tightly to prevent leakage. Then turn closer over with the other end up in the vise. Remove filling screw and pour fluid in hole until level with rim. Move arm to force out air bubbles. Then paint the filling screw threads with white lead and screw the screw in tightly. If there was a washer under filling screw, replace it with a new one.

Paint closer and regulate the adjusting valves.

CORBIN



PACKING
NUT WRENCH

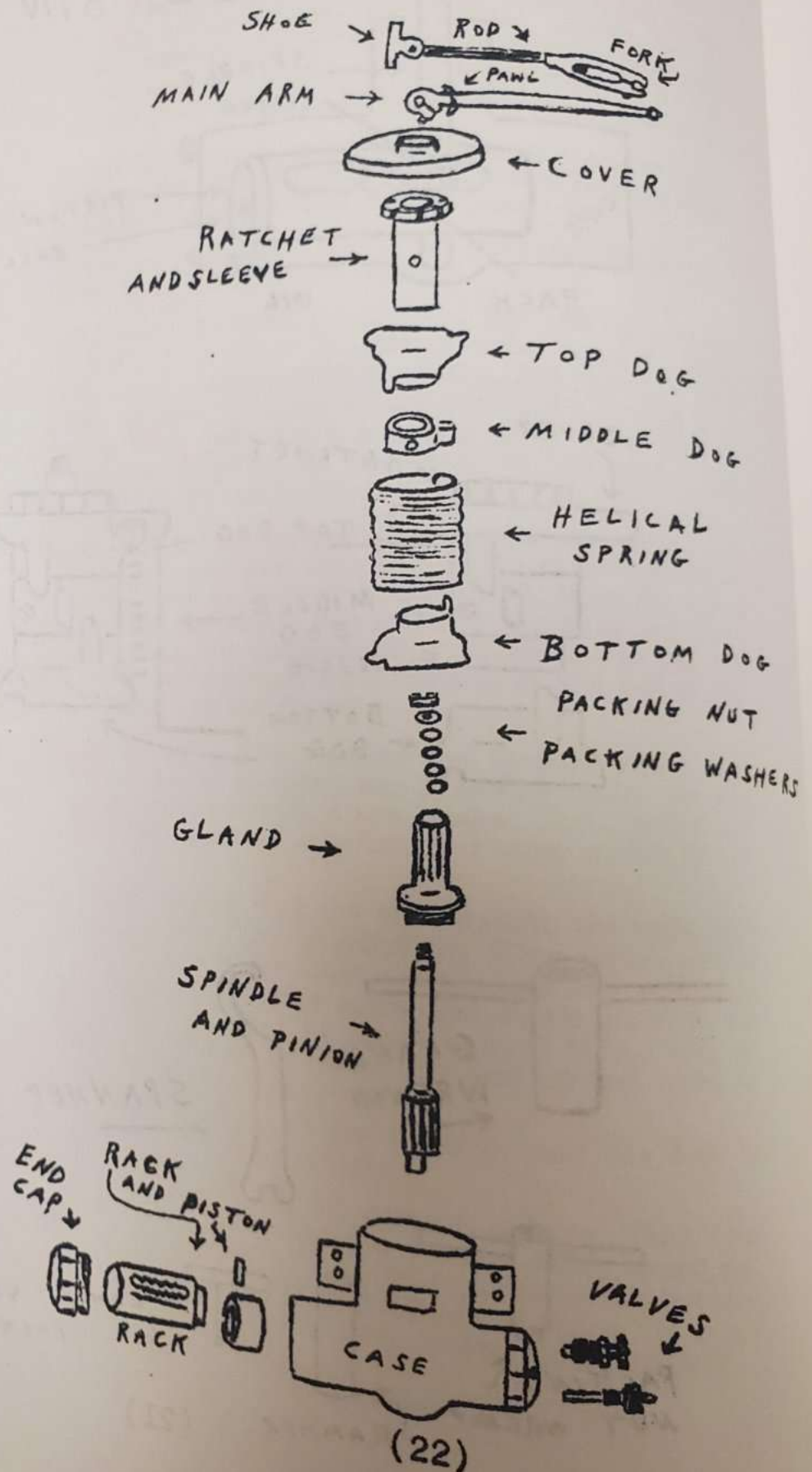


RAMMER



LOWER VALVE
PACKING NUT WRENCH

CORBIN



Russwin

The Russwin closer is the same general shape as Yale, Corbin and the rest. But the Russwin closer, like Yale, uses the crankshaft type spindle instead of the rack and pinion.

To take this closer apart, use essentially the same procedure you used with the Yale closer. Remove the nut at top of spindle and lift off the main arm. Then lift off the ratchet and ratchet pin. The Russwin ratchet is rather thin and flat and has no sleeve attached. The ratchet is not attached to the cover or the dog, and it can be removed without taking the cover off the closer. Just lift the ratchet up and remove it. First release spring tension by winding ratchet with ratchet wrench, then remove pin, and unwind slowly.

Remove the cover by tapping up around the rim. Take out the top dog, spring, middle dog and bottom dog. To remove middle dog you must remove the nut that is over the middle dog. Use your middle dog nut wrench. Lift the middle dog up with your middle dog lifter. This tool has a bent hook on the lower end. Insert the hook beneath the middle dog. Place a spindle cap on top of the spindle to protect the threads. The spindle cap is a short round cap that fits over the end of the shaft. Take a hammer and tap gently on the cap, at the same time pulling the middle dog up with your middle dog lifter. In case the middle dog is stuck and hard to remove, this procedure will vibrate the dog up as you lift with the lifting tool. Do not hit hard enough to damage closer.

Next remove the gland packing nut with your packing nut wrench. Take out the metal washer and the fibre packing washers. With the packing gland wrench, remove the packing gland.

Unscrew the end cap with your stillson wrench and pour out the hydraulic oil. Push end of screwdriver in through open end and remove the machine screws from the piston arm collar. Now the piston and rod are disconnected from the crankshaft. Lift the crankshaft out through the top of closer. Push the piston out through the end of the closer. If you desire to remove the piston rod from the piston, a pin holds it in. Punch out the pin. Usually this is not necessary for cleaning.

Clean the parts as described in chapter on Cleaning Closers.

To assemble the closer again, reverse the process of taking it apart. Insert piston through the open end. Insert the crankshaft from the top of closer. Fasten the piston arm collar in place with the machine screws to connect the crankshaft to the piston arm. The piston itself is already connected to the piston rod with a pin.

Paint the packing gland threads with white lead and screw firmly in place. Install the packing washers and ram them in place with your ramming tool. Put metal packing washer on top and screw the packing nut down tightly with packing nut wrench. With main arm, move left and right to settle packing washers. Tighten packing nut again. Repeat several times.

Put in bottom dog, spring and middle and top dogs. Remember, there is a nut that screws on over the middle dog. Use your middle dog nut wrench to tighten this nut. Replace the cover and then the ratchet, with the pin holes in the ratchet facing the front of the closer.

To install spring and dogs, turn the shaft left until the corner point at top of shaft points forward toward the name plate of closer. Now drop in the bottom dog, called the spring plate. Turn it to left until it catches and stops. Insert the middle dog on the shaft and let it drop down into position. The long ear of the middle dog must be the left. Let dog drop down until this long ear fits into position to slide left and right in the bottom spring plate. Put in spring and top dog (spring plate).

You must train yourself to observe things like this as you take any closer apart. Notice how each part is constructed and how it is placed in the closer in relation to the other parts. This will save you a lot of time and trouble at times when working on closers with which you are not familiar.

Put on the main arm and nut. Main arm must point toward front of closer, of course. Fill with fluid, same as filling other make closers. Fill till fluid is even with rim of end of closer. Paint end cap threads with white lead and screw end cap on tight after pumping out the air bubbles by moving main arm as described for other closers.

Turn closer so the other end will be up in the vise. Remove the filler screw and fill to brim. Move arm to get rid of bubbles. Replace the filler screw after sealing with white lead.

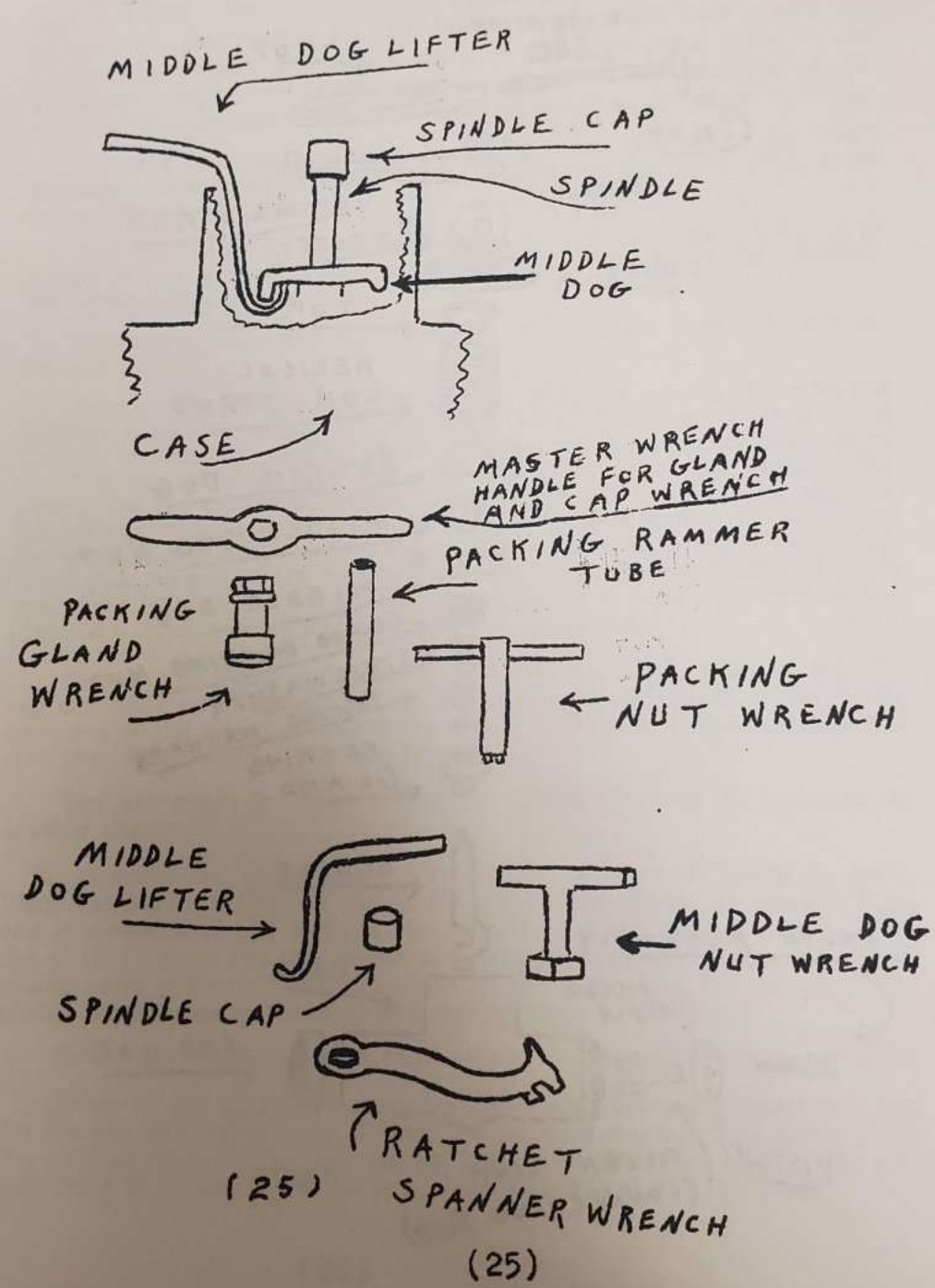
Now place closer in upright position in the vise. You are ready to adjust the spring tension. With your ratchet spanner wrench, wind the ratchet to the left which of course winds the spring. There are four holes in the ratchet. 1, 2, 3 and 4, counting from left to right. Wind the ratchet until hole number 2 is moved into position just to the right of the arm. Now push the ratchet pin down in this hole number 2 and the pin will hold the arm so that spring tension will be held. This will be about the right spring tension for the average door, but you can change the tension or closing power by moving ratchet around so pin will be in another hole.

The pin must always be to the right side of the arm, whether it is used on a right or left hand door. Remember, too much spring tension makes the door hard to open and increases the possibility of spring breakage.

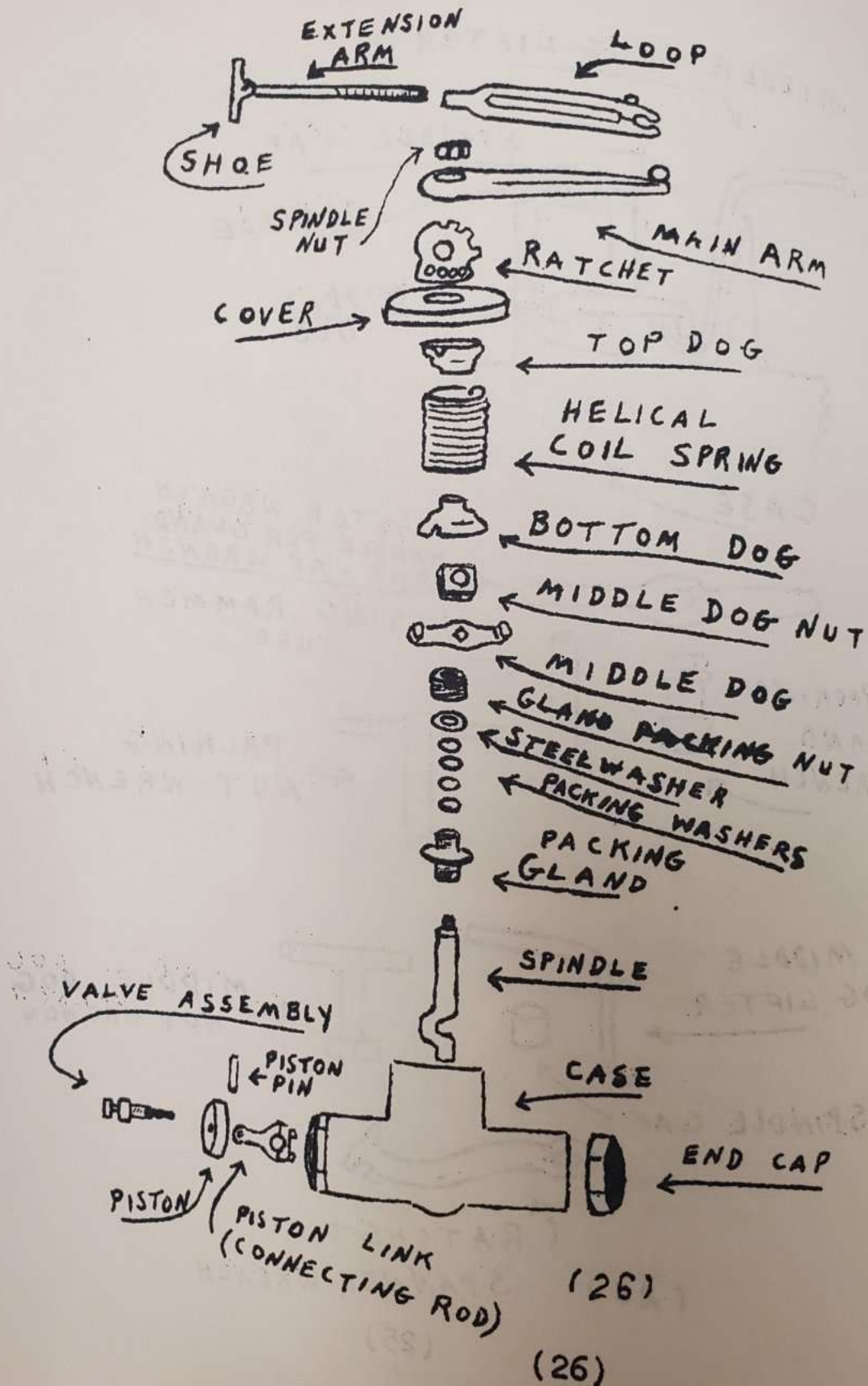
To regulate the closing speed, turn the adjusting valves. This is a single valve assembly with two adjusting screws. To make the door close faster turn the outside knurled screw to the left. This controls the closing speed until the door is almost closed. Then the latching speed control slows the speed to close the door gently. To regulate the latching speed, turn the inside knurled nut next to the closer case, for this nut regulates the latching speed valve.

Turn to right to decrease speed. Turn left to increase speed.
Put on name plate and paint closer.

RUSSWIN



RUSSWIN



Ilco

Ilco makes both crankshaft and rack and pinion type closers. The rack and pinion closer has ball bearings to support the shaft and make it turn easy. One bearing is at the bottom of the closer case to hold the bottom of the shaft. The other bearing is above the pinion teeth of the shaft and is in the lower part of the packing gland. The bearings can be replaced when necessary simply by removing them and installing new ones.

To take this closer apart, remove the nut from top of the shaft (spindle). Remove the arm. Lift off the ratchet and then remove the cover by tapping up around the rim.

Lift out the clock type spring, and observe which way the spring is placed, so you can put it back in the same direction when you assemble the closer again.

There is a round flat disc called the spring plate under the spring. Remove this.

Remove the packing nut with your packing nut wrench. Remove the packing, consisting of an "O" ring and a back up washer. With a gland wrench, unscrew the packing gland. This wrench for the rack and pinion closer is shaped to fit over the nut shaped bottom of the gland. The wrench for the crankshaft closer, described later is the lug type wrench, having projecting lugs which fit down into three slots cut in bottom of the gland. Some Ilco closers use a similar wrench with three projecting round pins instead of the squared off lugs. These pins of course fit down into three holes in the bottom rim of the gland. It is easy to look at the gland of a closer and tell which type of wrench to use.

Remove the gland and bearing. Lift out the shaft. Remove the end cap and pour out the fluid. Push the rack and pinion out through the open end of the closer. Remove the valves. There is a valve at each end of closer. Remove the lower ball bearing.

You are ready to clean the parts. Read Cleaning Instructions in another chapter.

To assemble the closer again, reverse the process of taking it apart. Place bearing in bottom of closer. Push rack and pinion in through open end of closer, with the teeth in the rack toward the back of closer. Place the shaft in from the top of the case and be sure that the teeth of the pinion mesh properly with the teeth in the rack. The first tooth of the pinion should engage the first and second teeth of the rack.

Rotate the shaft left and right to see if the piston moves correctly.

Screw in the gland after placing the upper bearing in position. Seal the threads with white lead. Insert the packing washers and screw down the packing nut. Put in the spring plate and then the spring. Be sure the spring is turned in the same position as when it was removed.

Put on the cover and then put on the ratchet by inserting the sleeve end of the ratchet down through the hole in the cover. The inner hook of the spring must engage the slot in the ratchet sleeve. Turn the ratchet with your ratchet wrench to see if it is engaged properly and if it is you will feel the spring wind under tension as you turn the ratchet.

Put on the arm and screw on the nut at the top of the shaft.

Wind the ratchet to the desired spring tension and push the pawl into the proper notch of the ratchet to keep the ratchet from turning back and unwinding the spring.

Put in valves and pour fluid in through open end. Pump piston and arm to force out air bubbles. Screw on the end cap after sealing the threads with white lead.

Adjust the valves for closing speed. Paint the closer and replace the nameplate.

Ilco Universal

The crankshaft Ilco closer resembles other closers of this type. To take it apart, remove the nut and main arm. Lift off the flat ratchet and take off the cover by tapping up around the rim.

Remove the spring, top dog or plate and the middle dog and lower dog or plate. These resemble the Yale spring and dogs. The spring is the helical type. Top and bottom spring plates are the same size and shape.

Use your packing nut wrench to unscrew the packing nut, and then remove the packing washers, consisting of an "O" ring and back-up washer.

With your gland wrench, unscrew the gland and then remove the end cap opposite the valve end of closer. Pour out and discard the hydraulic oil. Remove the valve assembly by unscrewing. Remove the pin in the piston and lift out the shaft and connecting rod together as a unit. Push out piston.

Now you are ready to clean the parts. See the chapter on Cleaning Closers.

To assemble the closer again, reverse the process of taking it apart.

Insert the piston through the open end of the closer and put the crankshaft and connecting rod in through the top. Put in the piston pin to fasten the connecting rod to the piston. Stake the pin so it won't work up and make scars in the piston chamber wall. To do this take a punch with a pointed end and with a hammer, tap the punch down around the pin at various spots. This will make the metal around the pin spread and hold the pin tight. This is called staking the pin. Sometimes you can punch at just one point and hold the pin. Remember this point if you service closers of similar construction, of other makes and remove the pin.

Screw in the gland with the gland wrench. Put in the packing

washers then screw in the packing nut with your packing nut wrench. Put in the spring, top dog and middle dog as you did in the Yale closer. Put on the cover and put on the flat ratchet, with the notches toward the front.

Put on the arm and screw the nut on top of the shaft. With the ratchet wrench, wind the ratchet to desired spring tension. There is a pawl attached to the arm. Engage this pawl in the notch of the ratchet that is lined up with the pawl, to keep the ratchet from turning backward and losing spring tension. Screw in the adjusting valve assembly.

Turn closer end-up in the bench vise and pour in the hydraulic fluid. Pump out the air bubbles. Pour in fluid till it is level with ring of end of case. Screw on the end cap after sealing threads with white lead. Adjust regulating valve.

Screwing in the valve shaft regulates the closing speed. Latch speed is obtained by the position of the screw slot. When vertical it slows the latch speed. Horizontal increases the latch speed.

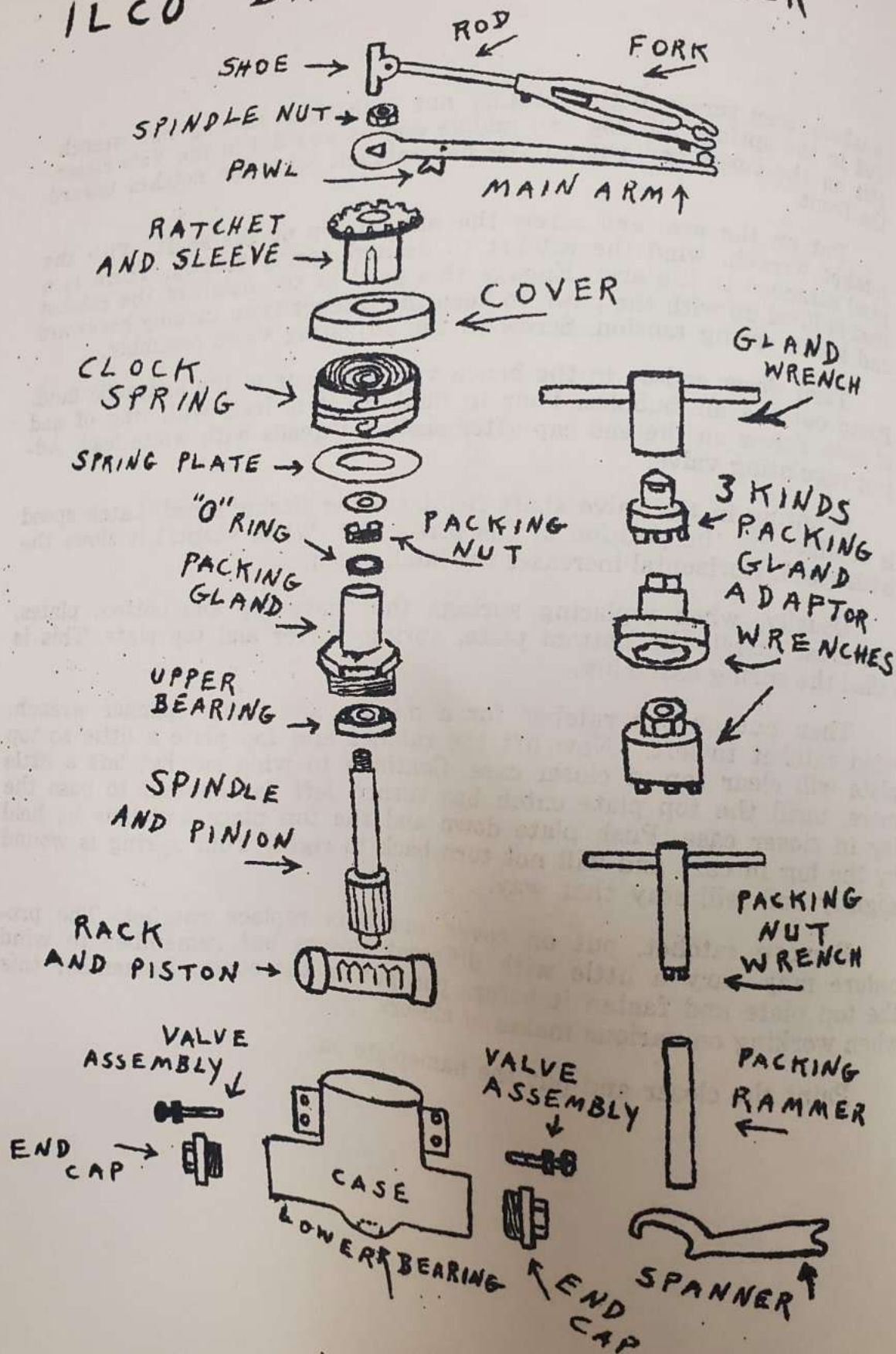
Usually, when replacing springs that have top and bottom plates, you must install the bottom plate, spring, driver and top plate. This is called the spring assembly.

Then put on the ratchet for a minute and using spanner wrench, wind ratchet to left. Now lift the ratchet and top plate a little so top plate will clear top of closer case. Continue to wind ratchet left a little more, until the top plate catch has turned left far enough to pass the lug in closer case. Push plate down and the top plate will now be held by the lug in case and will not turn back to right. Your spring is wound slightly and will stay that way.

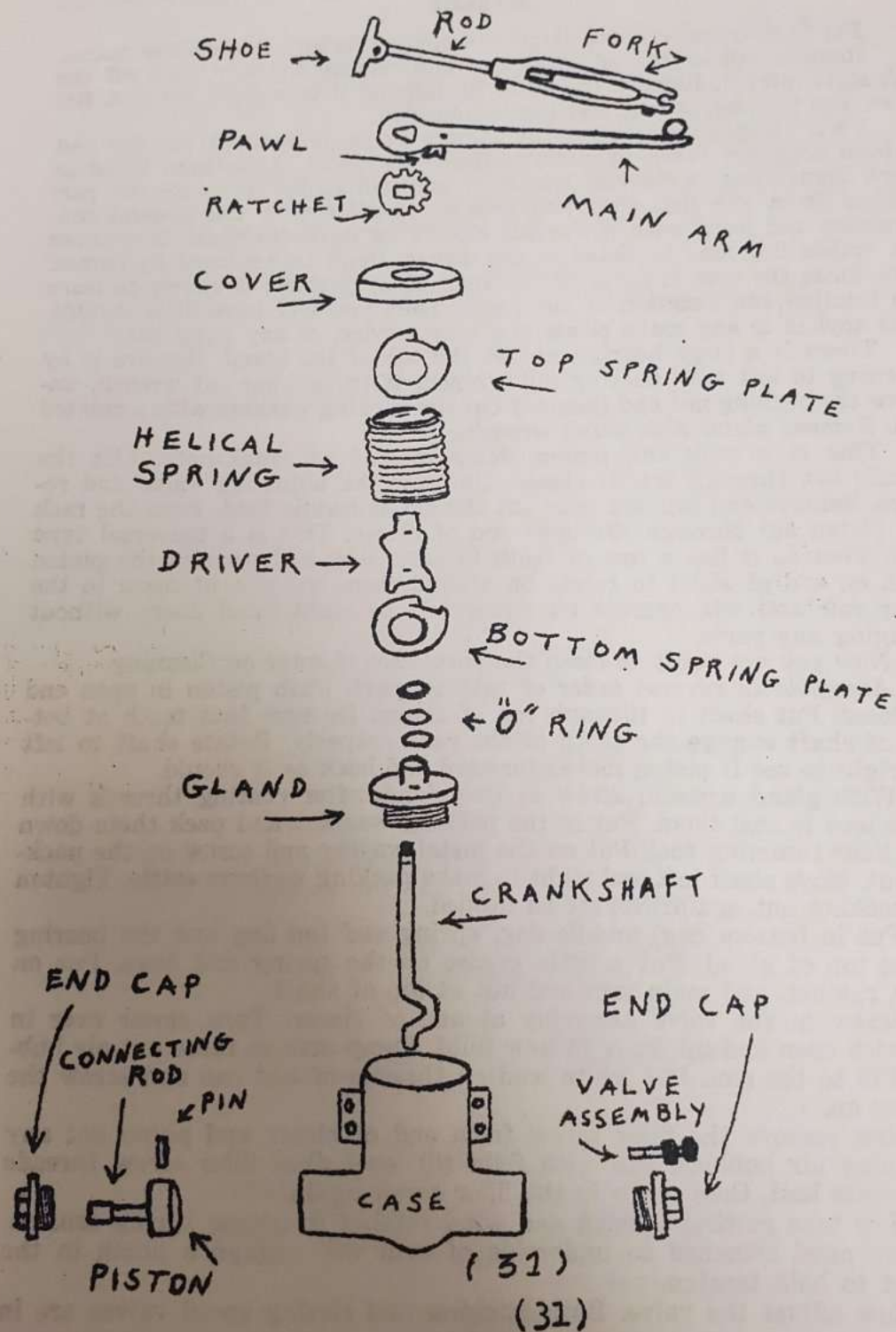
Remove ratchet, put on cover and then replace ratchet. The procedure may vary a little with different closers but remember to wind the top plate and fasten it before you put on the cover. Remember this when working on various makes of closers.

Paint the closer and put the nameplate on.

ILCO BALL BEARING CLOSER



ILCO UNIVERSAL CLOSER



Sargent

For Sargent closers, use about the same procedure as for other makes. Remove nut at top of main arm and remove the arm. Lift off the flat style ratchet. Remove the cover by tapping it up around the rim. Remove the top dog, spring and the bottom dog.

I am using general terms in naming parts. Sometimes the top and bottom dogs are listed by manufacturers as plates. Sometimes listed as dogs. Sometimes as sleeves. However, you will easily recognize the part desired from any list after you become familiar with the general construction and parts used in various closers we have described. Sometimes the middle dog may be listed as the driver. Don't be confused by names. Sometimes the case is listed as the shell. Your problem is simply to learn the location and function of the parts. Then you will have little trouble. This applies to any make closer you may service, or any parts list.

There is a large bearing nut at the top of the gland. Remove it by screwing to left with bearing nut wrench. With packing nut wrench, unscrew the packing nut and then pry out the packing washers with a pointed tool. Remove gland with gland wrench.

This is a rack and pinion closer instead of crankshaft. Lift the spindle out through top of closer. Unscrew the adjusting valve and remove. Remove end cap and pour out the old hydraulic fluid. Push the rack and piston out through the open end of closer. This is a universal type rack. That is, it has a row of teeth in each side, and permits the pinion teeth on end of shaft to rotate on around from one row of teeth to the other row and will operate on either left or right hand doors without changing any parts.

Now you are ready to clean the parts. See chapter on Cleaning.

Assemble in reverse order of taking apart. Push piston in open end of closer. Put shaft in through top of closer. Be sure that teeth at bottom of shaft engage the teeth of the rack properly. Rotate shaft to left and right to see if piston moves forward and back as it should.

With gland wrench, screw in the gland, after coating threads with white lead to seal them. Put in the packing washers and pack them down with your ramming tool. Put on the metal washer and screw on the packing nut. Move shaft left and right to make packing washers settle. Tighten the packing nut again. Repeat as needed.

Put in bottom dog, middle dog, spring and top dog and the bearing nut at top of gland. Put a little grease on the spring and dogs. Put on cover, ratchet, and main arm and nut at top of shaft.

Screw in the valve assembly at end of closer. Turn closer over in vise with open end up. Pour in new fluid. Pump arm to force out air bubbles. Fill to the rim. Put white lead on threads of end cap and screw the end cap on.

Now remove the filler screw from end of closer and pump out any remaining air bubbles. Fill with fluid till level. Seal filler screw threads with white lead, then screw in the filler screw again.

Now take ratchet wrench and wind ratchet to proper spring tension, and the pawl attached to underside of arm will engage a notch in the ratchet to hold tension.

Now adjust the valve. Both latching and closing speed valves are in

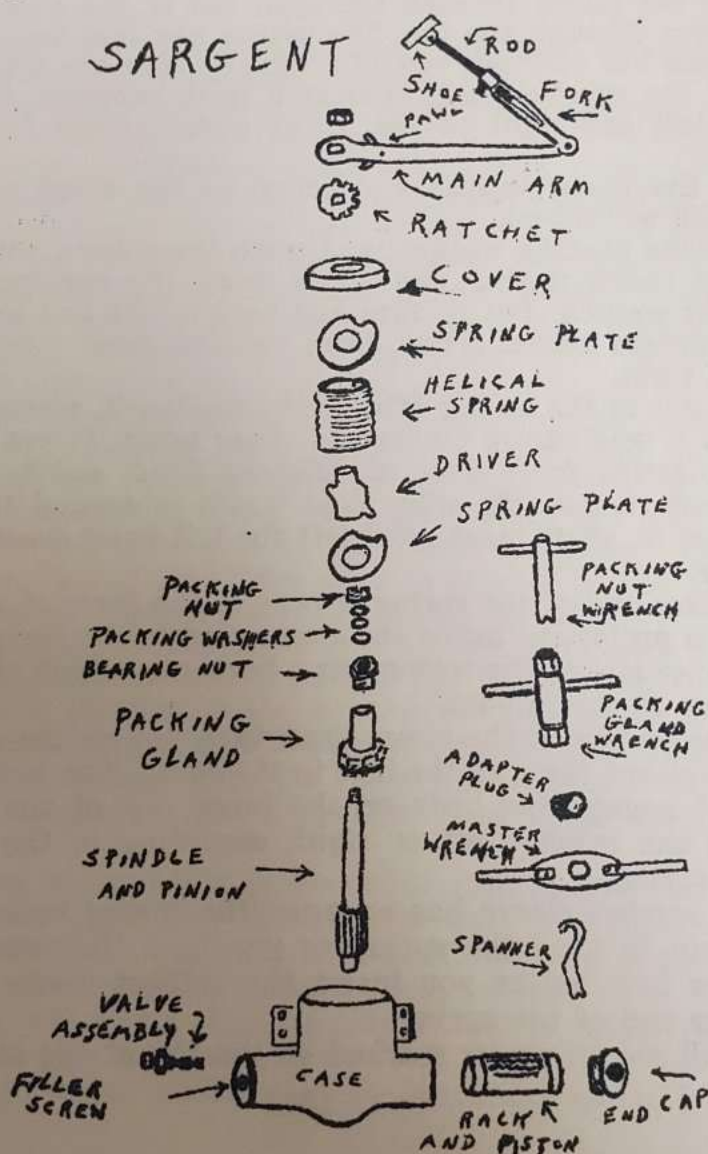
one valve assembly, at one end of closer. The outer knurled nut governs the closing speed. The inner pointer controls the latching speed.

Put on name plate and paint the closer.

The Sargent end cap is not nut shaped on the outside. Instead there is a nut shaped depression in the center of the cap. To remove the cap, place your adapter plug in the depression in the cap. This adapter plug is the same size and shape as the depression.

Now use your adapter wrench to turn the plug (and of course the cap). The adapter wrench has long extending handles and a cut out hole the same size and shape as the adapter plug. So, the adapter plug fits in the nut-shape depression of the cap. The adapter wrench fits over the extending part of the adapter plug. So, unscrew the end cap, just turn the adapter wrench to the left.

You will find other closers with the depression in the cap. These are removed in the same way. See illustrations of Sargent parts and tools on another page.



Norwalk

To service the Norwalk closer, use essentially the same procedure as used on other makes.

Remove the nut from top of spindle and take off the main arm. Lift off the ratchet. Remove the cover by tapping up around the rim. Take out the clock type flat spring. Note the direction of the spring so you can replace it the same way. There are no middle, top and bottom dogs.

Unscrew the packing nut with your packing nut wrench. With your packing gland wrench unscrew the gland. Remove washer and packing washers.

This is a rack and pinion type closer, so lift out the shaft. Remove the end cap and pour out the fluid and discard it. Remove the adjusting valves. There is a valve assembly at each end of the closer and both end caps may be removed if desired for some special reason. Remove piston through the open end.

You are ready to clean the parts. See section on Cleaning.

To assemble the closer, reverse the procedure used to take it apart.

Insert the piston through the open end of the closer and push the spindle down through the top. The piston and rack are one single unit, and the rack has only one row of teeth. Be sure the pinion teeth at the bottom of the spindle engage the rack teeth properly. Rotate the shaft (spindle) left and right to see if the piston moves forward and back properly.

Take the gland wrench and screw in the gland after sealing the threads with white lead.

Insert the packing washers and tamp them down with the ramming tool. Insert metal washer and screw down the packing nut with your packing nut wrench. Put on arm and rock it left and right to make the packing washers settle. Screw down the nut some more and repeat till packing is tight.

Next, put in the spring after first greasing it, placing it in the same position as it was before taking the closer apart. If you want to reverse the spring action for a door of different hand, simply turn the spring over. Do not remove the wire band which is around the spring. Leave it on. Arrow on shaft must point left for left hand closer, right for right hand closer.

The outer end of the spring is bent in the form of a hook. This hook catches on a projection inside the closer case in the spring compartment.

The inner end of the spring has a hook too, which catches in a groove in the sleeve of the ratchet.

Put the spring in the closer first, then put on the cover. Now insert the ratchet sleeve through the hole in the cover. The groove in the ratchet sleeve must engage the hook on the inner end of the spring. Test this by turning the ratchet left or right, according to the direction you inserted the spring.

If the ratchet sleeve has engaged the spring hook you will feel the ratchet begin to wind the spring as you turn the ratchet. You can look in the cover hole before you insert the ratchet sleeve and see the hook on the inner end of the spring.

You will see an arrow marked on the top of the shaft. On the closer

you will see the letters L and R (for left and right).

Turn the shaft so the arrow points to R if closer is to be used on a right hand door. Arrow must point to L if it is a left hand door. Put on the main arm and screw on the nut at top of shaft.

Put in the adjusting valves, first sealing the threads with white lead. Pour in the hydraulic oil through end of the case. Pump the arm to force out air bubbles. Fill to rim.

Screw on the end cap after sealing threads with white lead.

With ratchet wrench turn the ratchet to wind the spring to desired tension. The pawl which is attached to the main arm will slip into the line-up notch in the ratchet and this prevents the ratchet from turning back and releasing the spring tension. That is, it keeps spring from unwinding.

Adjust the regulating valves. The valve stems are slotted and you can use a screw driver to turn the stems left or right for adjustment except in a few cases where the stem must be turned with a key which resembles a skate key or clock key. In this case use the key to turn the stem and adjust the valve.

To adjust the closing speed, screw the valve stem left or right with a screw driver to decrease or increase the speed.

The position of the screw driver slot on the stem regulates the latching speed, due to a flat place on the stem. If the slot is vertical, that is, pointing up and down, the latching speed will be slow. If the screw driver slot is horizontal (level) the latching or final speed will be fast.

Since there is a valve on each end of the closer, you must adjust the valve on one end or the other, depending on the closer. For closers with regular arms pointing straight out (perpendicular) toward front of closer, adjust the valve nearest the door hinge. For closers using the parallel arm, pointing to side of closer, adjust the valve farthest from the door hinge. In either case the valve you adjust is known as the active valve. The valve at the other end of closer is known as the inactive valve. The piston (and rack) is a one piece unit with a piston head on each end.

You can adjust the inactive valve to get "back-checking" action if you like. After adjusting the active valve for closing and latching speed you can adjust the inactive valve to offer mild or strong resistance as the door is opened. This is sometimes done to prevent a door from being opened hard and shoved against a wall. To obtain back check action during the entire opening swing of the door, turn a valve stem with your screw driver. To obtain back check for the last part of the opening swing, it depends on the slanting position of the screwdriver slot. If the slot is horizontal, straight across, there is no back check at the final opening point. If the slot is vertical, straight up, the valve will be closed. Do not leave inactive valves in completely closed position. Back check does not affect forward closing.

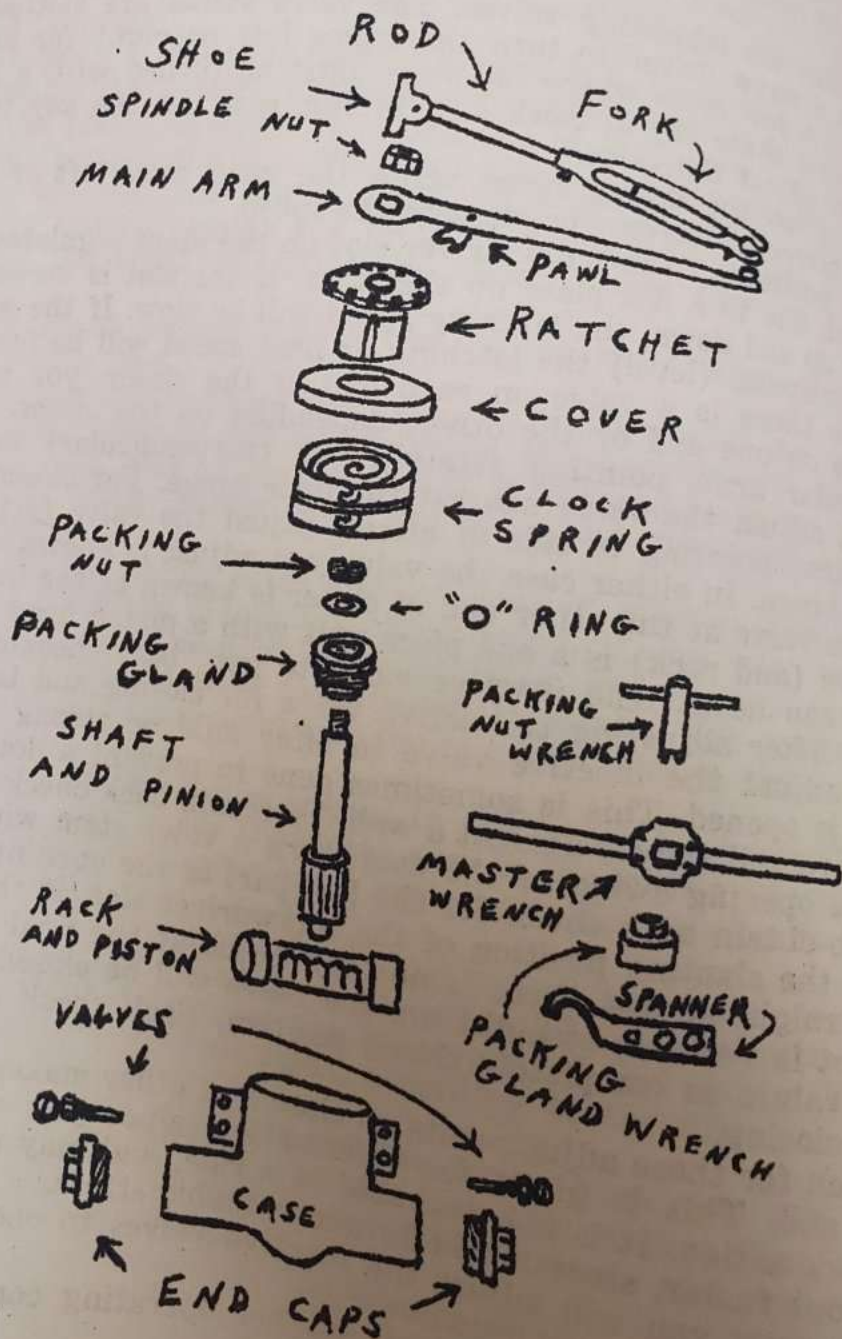
Watch for these adjustments on closers of other makes, having valves at each end. This is given for information, since you will seldom use back check action. It is not desirable as a rule, and may cause the closer to wear out faster, since it will be under double stress.

Ordinarily you will adjust the inactive valves to open position with no checking action as you open door.

When checking closers which are not operating correctly on doors,

be sure to see if someone has tampered with the inactive valves and caused them to offer back check resistance. Actually, back valves are obtained when the double ended piston moves toward the inactive valve, and it is partially closed instead of open. To correct this, turn the inactive valve to full open position to allow door to be pushed open freely.
After assembling the closer put on the name plate and paint closer.

NORWALK



Norton

The Norton closer resembles the Norwalk in general features. It is rack and pinion type and has clock spring.

To take this closer apart, remove nut from top of shaft and take off the main arm. Then lift up the ratchet and remove it. Remove cover by tapping up and around the rim. Lift out the spring, making a note of its position so you can put it back the same direction when assembling closer again. To reverse the hand of this closer, simply turn the spring over, the same as with other closers of this type.

Unscrew the packing nut with your packing nut wrench. Then take out the packing washers. With the gland wrench unscrew the gland and remove it. Unscrew the adjusting valves and remove them by unscrewing the valve nuts.

Remove end cap. Pour out the hydraulic oil and discard it. Lift out the shaft through top of closer and remove piston through open end.

The rack and piston are made into one unit. The rack has only one row of teeth.

Now clean the parts. See chapter on Cleaning.

To assemble the closer again reverse the procedure of taking it apart.

Push rack and piston in through the open end of closer. Put shaft in through top of closer and see that teeth mesh properly with teeth of the rack. Turn shaft left and right to see if the piston moves forward and back correctly.

Screw in the packing gland with gland wrench. Put in packing washers and screw down the packing nut with packing nut wrench after packing is tamped down with the ramming rod.

Put in the spring the same position as it was when removed. The outer hook of the spring catches on the edge of a slot cut in the closer case itself, instead of on a projection on the inside of case, as some other closers do.

The inner hook of spring will of course engage in the slot of the ratchet sleeve when the sleeve is inserted properly.

Now put the cover on the closer and push the ratchet sleeve down through the hole in cover. The groove in the sleeve must be in line with the hook of the inner end of spring.

There is a small slot cut in the rim of the cover. The cover must be put on with this slot in line with the slot at the back of the case. This slot in the cover will then fit down over the top part of the outer hook of the spring, which, remember, is engaged in the slot in the case.

Wind the ratchet a little with the ratchet wrench to see if you are getting spring tension. Screw in the adjusting valves. Put on main arm and nut.

Pour hydraulic oil in open end of closer. With arm on closer, pump out the air bubbles. Fill to the rim with oil. Coat end cap threads with white lead and screw on the end cap.

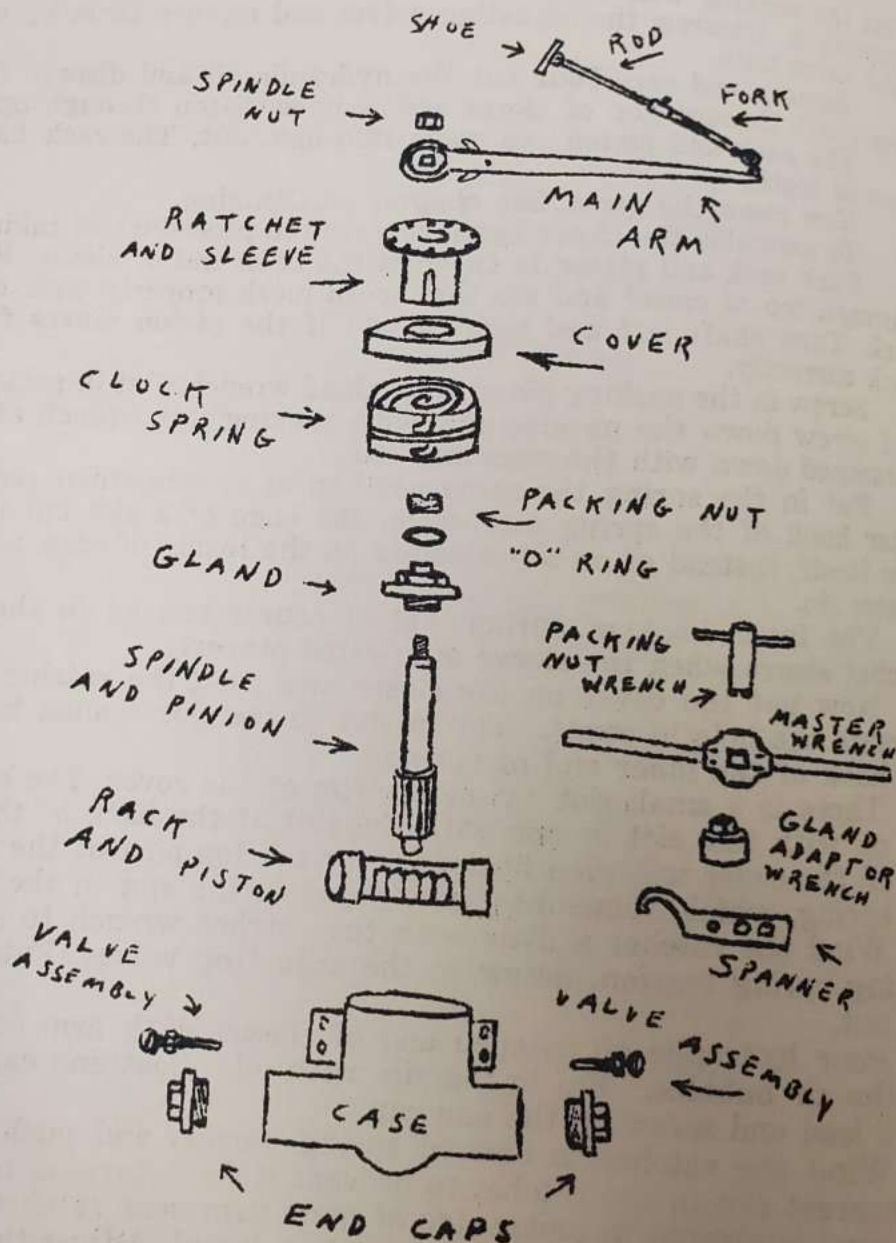
Wind the ratchet to desired spring tension and push the pawl into the nearest slot in the ratchet to prevent it from turning back to unwind. The pawl is riveted to under side of main arm near ratchet.

Adjust the valves. Has a valve at each end. Adjust the valve nearest hinge on door. Screw valve shaft in or out to regulate closing speed. Po-

sition of screwdriver slot regulates the latching speed. Straight up and down, vertical, slows latch speed. Straight across, horizontal, increases latch speed.

If back check is desired when opening door, it can be obtained by regulating the inactive valve, the one farthest from the hinge. Otherwise leave the inactive valve open. non-checking, unless you desire back check. Put on name plate and paint closer.

NORTON



LCN

The LCN closer resembles the Norwalk closer in general features. It is the rack and pinion type and the rack has one row of teeth.

It has clock spring and it must be turned over to reverse the hand of the closer.

To take closer apart remove the nut from top of shaft and lift off the main arm. Lift off the ratchet and remove the cover by tapping up around the rim. Take out the spring, noting which direction it is placed, whether left or right hand so you can put it back the same way when you assemble closer again. Remove the bearing nut and then the packing nut. Remove the packing washers. Remove the packing gland with gland wrench. Remove the adjusting valves by unscrewing valve nut.

Unscrew the end cap and pour out and discard the old hydraulic fluid. The end cap has a square depression in the middle. The end cap wrench has a square plug which fits in this square hole to enable you to unscrew the cap.

Lift out the shaft through top of closer and push rack and piston out through open end.

Clean the parts, see chapter on Cleaning.

To assemble the closer, reverse the procedure used to take it apart.

Push rack and piston in through open end. Insert shaft down through top of shell. See that pinion teeth and rack teeth mesh properly. Rotate shaft left and right to see if piston moves forward and back correctly.

Screw in packing gland after sealing threads with white lead. Install new packing washers and ram tight with ramming tool. Screw packing nut down tightly. Put on arm and move left and right to make packing settle. Tighten packing nut again. Repeat till packing is completely seated.

Put on the shaft bearing nut and then put in the spring. It must be placed in same position as before it was removed. Always grease springs when installing them. A little heavy oil will do if you don't have grease handy. Automobile grease is OK. Watch for this in replacing other springs also in other makes of closers.

Put on cover. Insert the ratchet sleeve through the hole in cover. This will of course leave the ratchet itself on top of the cover. Be sure that groove in ratchet sleeve engages hook of inner end of the spring.

Wind ratchet slightly with ratchet wrench to test for spring tension. Put on main arm and put on nut at top of shaft. Screw regulating valves back in place.

Place closer in bench vise with open end up. Pour in new hydraulic oil. Pump piston to force out air bubbles. Fill to rim. Put on end cap after sealing threads with white lead.

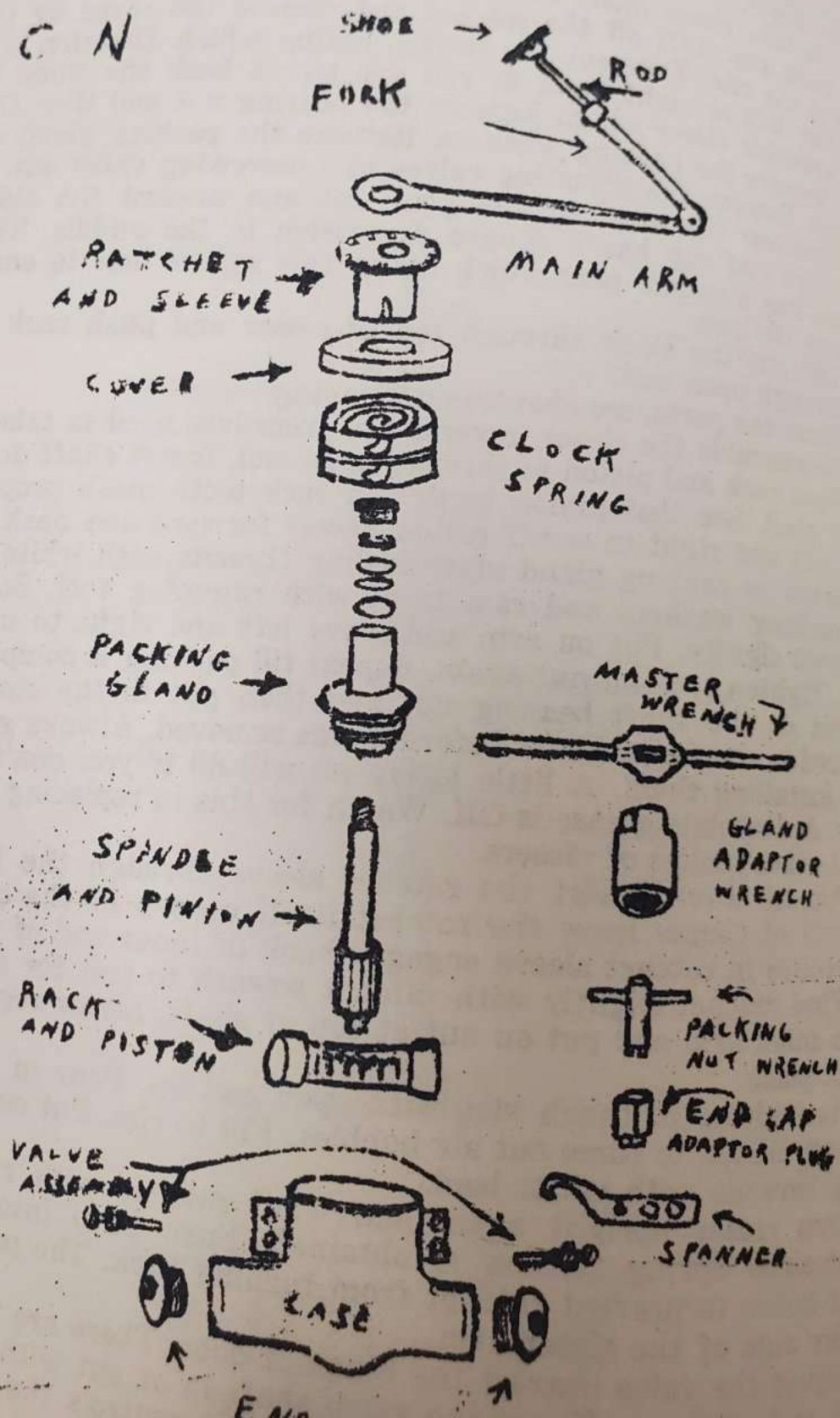
Turn closer upright again and wind ratchet with ratchet wrench until desired spring tension is obtained. Push pawl into the lined up ratchet notch to prevent ratchet from turning back. The pawl is attached to under side of the closer arm.

Adjust the valve nearest the hinge of door. There are two valves, one at each end of closer. Screw the valve shaft in or out with screwdriver to regulate closing speed. Position of screw slot controls the latching speed. Vertical position slows speed. Horizontal increases it.

If you desire back-checking action, regulate the inactive valve, the

one farthest from the hinge. Do not leave the screw slot in complete closed or vertical position or the closer may be broken when door is shoved hard. Ordinarily, leave the inactive valves open. Back check is not recommended in most cases.
Put on name plate. Paint closer.

L C N



Lockwood

The Lockwood is another popular make of standard closer. To service the Lockwood, use the same general methods described for other makes.

Lockwood closers come in both styles. Some models use the flat clock spring, and the hand may be reversed by turning the spring over. This is the ball bearing closer.

The other type uses the helical spring and is universal, working left or right.

You will find both crankshaft and rack and pinion construction. Since you are already familiar with both types, it will not be necessary to give detailed instructions for these and other closers.

At this point you should be able to service most standard closers with little difficulty. Now you are on your own.

Cleaning

Unless the closer has recently been cleaned, or is a practically new closer, it is always necessary to clean all the parts thoroughly before assembling the closer again. To clean the parts, of course you must take the closer completely apart, clean all parts, then assemble again, and paint closer.

This cleaning process is one of the basic secrets of good door closer repair work. In fact, if you don't clean all the parts you will probably have to do the job over. You should clean every part of every closer you repair, unless you know positively it doesn't need cleaning. All parts must be clean, or the closer will not work properly.

Many closer repair men refuse to repair a closer at all unless they can do a complete overhaul job, complete with cleaning, and a new paint job, new fluid, new packing, and all worn parts replaced. Then they guarantee the closer to work for a certain period, usually six months to a year.

You may replace a spring, an arm or adjust the closer without cleaning if it is in good working order, but it is best to insist on overhauling the closer completely for a flat charge for the job, in most cases.

In some cases you can clean the closer parts with a strong brush and some gasoline, benzene, kerosene, flushing oil, or other grease cutting solution. But often you will find the fluid has hardened, and there will be hard gummy deposits in the closer, and can only be removed by boiling all the closer parts in a vat of boiling water containing some sort of strong detergent or caustic soda solution, such as sal soda. This will dissolve the gum and oil from the parts, and probably will remove the paint from the closer, so the closer must be repainted before you return it to the customer.

You may obtain cleaning powder from a laundry supply house or perhaps get some from your laundry, or try some place that sells cleaning and janitors' supplies. There are a number of solutions that will remove grease and oil.

Never use gasoline or explosive liquids around a flame, and do not boil the parts in a liquid that will burn. When using caustic powders or

similar agents in your boiling water, be sure to avoid splashing the water solution, for you may receive serious flesh burns or injury to your eyes from splashing. When working around the vat of boiling solution, do not tip it over, or spill scalding water on yourself. Caustic is very powerful, but of course it will be somewhat weak in your water solution, but remember to be careful at all times. It is best to use rubber gloves to protect your hands. Try to avoid breathing fumes directly over the vat. Keep people away from your working area, for they may not be as careful as you. Never allow children near your boiling vat.

Your vat may be made from an old iron pot, or you could have one made at any sheet metal shop. Make a metal box from regular galvanized sheet metal, the kind used for roofs. It is made in the form of a rectangular box with no cover. It must not leak. Do not use aluminum vats.

The size of the vat depends on how many closers you intend to boil at one time. For a couple of closers, a very small vat would do. For a half dozen it would take a large vat. Never fill a vat with water to the top, for it will spill over when you put in the closer parts.

Never boil aluminum closer cases or parts in caustic solution, for the caustic will eat up aluminum, but not iron or brass.

To see if case is iron, use a magnet. Iron will be drawn to the magnet. Aluminum will not. Brass will not either, but you can tell brass from aluminum by scratching it and observing the color.

Use small wire baskets to hold the parts as you boil them. You can make baskets from small-mesh wire. The mesh of the wire must be small enough to prevent small parts from falling through.

Put one complete closer, disassembled in one basket. Have a wire handle to the basket, and let it hang from a wire down in the vat of boiling solution. Boil closer case, as well as the parts.

You can boil several at one time if you like. One lot of closers can be boiling while you assemble or disassemble others at your bench.

Heat the vat with any kind of heat you desire. Set it on an old oil stove or you can use gas, an old coal heater, or whatever you like.

Let the parts boil until they are clean. Put all parts in a basket and carefully slosh around in the solution a few minutes. Let boil about fifteen to thirty minutes depending on how much hard gum is on the parts. Do not place the name plate in the vat, for it will become dull.

Carefully remove the basket of parts from vat. Watch out for scalding water.

Rinse the parts in clean water. Hot water is best, but you can use a hose connected to a cold water faucet.

If possible, use an air hose to blow the sludge from vents and openings in the closer.

If any of the parts are not perfectly clean, use a stiff brush on them. If necessary, boil again.

Now you can use a very soft rotary wire brush on an electric motor, or on one shaft of your bench grinder to polish the parts if you like. Hold each part against the turning brush to polish the parts and remove any corrosion caused by the boiling water. It makes the parts smooth and shiny, and prevents rust. Be sure that all parts are perfectly clean before assembling.

Dry the parts with a cloth to prevent rusting. If you are not going to assemble the parts for a time, use an oil soaked cloth to wipe the parts. Instead of drying the parts, some prefer to dip them in some very thin oil. This oil removes any droplets of water and makes a thin oily film on the parts to prevent rusting.

You can use the same dipping oil over for a long time. Also you can use the same cleaning solution in your vat a long time. Use it until it becomes too weak to clean the parts, or until too much sludge accumulates in the vat. Use about two pounds of caustic soda to one gallon of water. Add more as needed.

Repairs

In most cases it is necessary to take the closer apart completely and boil and clean the parts. You can check each part to see if it is worn or broken. Defective parts are easily replaced since you have to assemble the closer again anyway.

Usually you will find that the closer has no defective parts, and it is only necessary to clean all the parts and put in new hydraulic oil, with new packing washers. If the closer has a sealing washer under the end cap, it is usually best to use a new one. In an emergency you can buy some gasket material from an auto parts place, and cut a washer out of this to fit the end cap. Always use a sealer such as white lead on threads of a closer.

You may be asked to repair a closer, only to find that the regulating valves need adjusting. The door may slam, or close too fast or too slow. So always try adjusting the valves before you take the closer from the door, unless the closer obviously needs a complete overhaul job anyway.

If you don't get any spring action and the door won't close, the trouble is probably a broken spring. In this case the owner may just want the spring replaced, or he may prefer a complete overhaul depending on the condition of the closer.

Sometimes you will find a broken closer arm. Replace it, but be sure to try to find the cause of breakage. Various things can cause an arm to break. The closer may be installed in the wrong place on the door, or if the closer has adjusting valves at each end, somebody may tamper with the inactive valves and close them. Then if the door is shoved open hard, the arm may break. If a piston jams, the arm may break, or the spindle may be twisted. Always check the spindle to see if it is twisted or bent when you overhaul a closer. Check pinion and rack for broken teeth.

If the door doesn't close at all, perhaps the pawl has slipped from the ratchet, letting the spring unwind. Wind the ratchet with your spanner wrench and slip the pawl in the proper notch when you obtain the desired tension. If you get no spring tension the spring is probably broken. You can check this while closer is on the door of course.

Check to see if the closer arm is mounted properly at the right angle. The foot bracket of the arm may be too far from the center of the spindle. See the chapter on installing closers. You may need to slant the main arm a little toward the hinge edge of door.

The ratchet may be wound around too far, causing the spring to be

too tight, and the door will be hard to open. Excessive spring breakage may occur. With your spanner wrench unwind the ratchet one or two notches to the desired tension.

While your closer is apart, be sure to see if the piston chamber is scored or scratched. Use a new closer case, or a good used one, if you find a scored piston chamber. If the piston is scored, replace it when assembling the closer. Use a new one, or a good used piston.

Sometimes the piston will be worn so much that oil will slip by the piston and compression will be lost as the piston moves forward. Close all the valves, and push the main arm around, then release it. The spring must be wound, of course. If the arm moves so slowly you can scarcely see the movement, you are getting good compression. If the arm moves faster, you are losing compression and the piston should be replaced, assuming that the valves are in good shape, and are completely closed when you test the closing action of the piston for compression.

If checking action releases slightly too soon or too late, spindle may be twisted. Replace twisted spindles.

A worn piston will permit the door to close too rapidly, due to loss of compression.

Other causes of a door closing too fast may be defective valves, improperly adjusted valves, or hydraulic oil that is too thin. This thin oil is probably some substitute oil used in place of regular door closer fluid.

Perhaps the hydraulic oil has leaked out past the packing washers, or maybe through an end cap that is leaking. When the oil has partially leaked out, the door may close fast or slam, because there will not be enough checking action due to lack of oil pressure in the piston chamber.

A complete overhaul job will take care of all these troubles in a routine manner.

In the majority of repair jobs you will find that the trouble is due to the hydraulic oil leaking past the gland packing. It eventually does this after the closer is used a long time. Often you will find that the remaining oil is caked into a hard mass, and difficult to remove without boiling all the parts in a cleaning solution. The parts may have dried oil on them, too. See the chapter on Cleaning. If the closer has been used a while, there is almost always some dried sediment present, so do the job right, and boil all the parts.

Often you will find that the only trouble is a broken spring. When replacing springs, put a little auto grease or even vaseline on the spring and around moving parts, and bearings. Put a little grease at main arm ball joint.

You may find that a closer is installed on the wrong side of the door for full power, see chapter on Installing Closers. Sometimes you will find that the closer is too small for that particular door, and it will not have enough power to close the door properly, especially in the face of a strong wind. You will need to install a larger closer. If the door won't open far enough, you may need a larger closer, which will have a longer arm.

Perhaps the closer is too large for the door, if the door is too hard to open, unwind the ratchet a little, and if it's still too hard to open, use a smaller size closer.

In a few cases the closer may be installed too close or too far from the hinge edge of the door.

In case of leakage, check to see if the closer case is cracked. If it is, use a new case or a used case in good condition. Also use regular door closer hydraulic oil. Old oil may be too thin.

This about sums up the most common ailments of door closers. You will find that most of these things have already been explained under the direction for overhauling the various closers, and will automatically be remedied in a regular overhaul job.

After cleaning and refilling a closer, if you find you are not getting enough checking force after adjusting the regulating valves, try replacing the valve assembly. If this fails, the ball valve in the face of the piston may be at fault letting the oil go through instead of closing when the piston moves forward.

Bend the wire over the steel ball inward slightly to take up slack, or replace it with a new ball.

If all this fails, it is possible that the piston is worn and losing compression, and in some cases you may find that the piston chamber is worn.

If a new piston still loses compression you need a new case, or perhaps it would be best to sell the customer a new closer if the old closer is worn beyond reasonable repair.

Door Closer Tools

It is impossible to service door closers with ordinary tools such as pliers, wrenches and screwdrivers. True, you will need these tools for a few jobs, such as removing or installing the closer on a door, or for removing the adjusting valve, or the main arm. It would be possible to replace a broken spring or new hydraulic fluid in case the closer doesn't have to be taken apart for rebuilding.

There are many makes and models and sizes of closers, and all of these have the same basic construction and parts. However, these parts are not standardized, and the parts of one closer would be of a different shape and size from the same parts in another make of closer. Therefore, a packing gland wrench for one make of closer would as a rule not fit the packing gland of another make.

Also, each make of closer is usually made in about a half dozen sizes of the standard or popular line of closers.

Usually the tool for one specific part of one size closer will not fit the same part in another size closer of the same make and model. This is understandable, for the packing gland in a large size closer would be larger than the packing gland in the smaller size closer of the same make and model, so the large packing gland wrench would not fit the smaller glands, though of the same shape.

Generally speaking, you will need the following special tools:

1. A packing nut wrench for removing the retainer nut at the top of the packing gland. This is the nut that screws down over the packing washers.
2. A gland wrench for removing the packing gland.
3. A ramming tube for tamping the packing washers down firmly.

If you prefer, you can get a set of these tools for the popular size

closers of only a few makes of closers — the ones you think you will service most. This depends on where you are located, for people buy the closers which are handled and sold by local stores, and in small towns you would perhaps have only a few makes to service, while in a large city you would no doubt have calls to service just about all makes.

You would also start with tools for the smaller and medium size closers, for in many cases you will be called on to service closers in regular doors on homes and stores which do not require the very large closers used on heavy doors in industrial buildings.

On the other hand, it is possible that you intend to go after the industrial type business as a specialty. Large factories and schools etc., usually have a lot of closers and quite often they are of the heavy type.

In any case, if you are working with a limited amount of capital, I would advise you to survey the field of operation carefully before you buy a lot of tools at random. It just depends on your individual intentions. If you are going to do general repair work on closers for the public, you will need tools for a large variety of closers. If you are going to do limited repair work for a few large buildings, you will probably need only a few sets of tools.

If you are going to do maintenance work for a large plant or school systems, it might be best to limit your tools to one make of closer and perhaps use a few sizes of this one make of closer throughout the buildings. If they are using several makes of closers, perhaps when a closer of a make different from the one you intend to use goes bad, you can replace it with a new closer of the make you desire, instead of repairing it.

Then eventually all of the closers would be of the same make, requiring only one set of tools.

It is probable that if you are doing maintenance work for a factory or school system that they will furnish the tools and a place for you to do the repair work. This would be the case especially if you are employed full time to do other maintenance work as well as repair and adjust the closers. In this case you can just order your tools to suit whatever closers you have in use.

But remember, for any one make of standard closer, you will need a packing nut wrench for each size of that make of closer, usually about six sizes. You will also need six sizes of gland wrenches, and six sizes of ramming tools. This is not true in every case, but is the general rule.

I am assuming that you will use a large stillson wrench to remove the end caps from your closers, otherwise you will need some end cap wrenches. I advise you to use the stillson wrench when possible. A few closers have depressions in the end cap instead of being nut shaped outside.

Besides the three tools mentioned — the packing nut wrench, the gland wrench, and the ramming tool, you will occasionally need some other special tool for some closers. The Russwin closer, for example requires a middle dog nut wrench for removing the nut which is located over the middle dog, at the top of the gland. You will need six sizes, a, b, c, d, e and f, one for each size of closer.

You will also need a middle dog lifter and a spindle cap for Russwin

closers. Only one lifter will be needed to service all sizes of closers. See Russwin instructions.

Various manufacturers use different names for the tools used to service their closers, but you will be able to easily recognize the tool you want on any manufacturer's price list of parts and tools.

The names used in this book are in general use by closer repair men, and you should have little trouble in obtaining tools and parts by using these terms in your orders, but it is always best to use the manufacturer's part name and also the part number if you can, when ordering.

You will need a few spanner wrenches for winding the ratchets, but these are not expensive, and one is included with each new closer sold, so you may be able to get these at no cost. You can buy a machinist's spanner wrench with the movable hook, and you can use this on practically all makes and models of closers. Always be careful when winding or releasing ratchets, for you could get a finger cut severely in the rotating ratchet teeth. Spanner wrenches often slip, so keep your fingers off the ratchet.

It is possible to make most of the special tools yourself for door closer repair work. By using pieces of pipe and rods, you can take a lathe and a welding outfit and make just about all of these tools, but it is best to buy ready made tools from the factory, especially if you intend to do a lot of closer repairs. These tools will last a long time.

Some of the wrenches come with one large handle and it will hold all the sizes of wrenches for that model closer.

For information on ordering tools see the chapter on Parts.

Parts, and Factory Addresses

You will need various parts to repair door closers. If you are doing limited work, such as repairing closers for a large plant or a school system, you will not need as many parts as you would in general repair work, for you would probably be dealing with only one or two makes of closers, instead of all kinds.

If you intend to start in a small way, at first it would be hard for you to keep on hand all the parts you may need, considering all the makes and models of closers in use.

This problem can be overcome by buying up a supply of used closers. You can get these for almost nothing if you will contact people who remodel old buildings, or people who buy old buildings and tear them down. Also carpenters can sometimes supply used closers they have taken down when installing new closers or installing new doors.

These used closers are usually not in working condition, so you can buy them cheap, and it will give you good practice in repair work, as well as help you solve the parts problem.

You can use many of the parts, even if the closer is beyond repair. The main arm, the case, cap, and other parts should be usable. Often you will get a closer to repair and accidentally crack the case or break some part in removing it. These old used closers will be a gold mine of

is all right to use old parts, since you are guaranteeing the repair job and the customer is not running any risk. Be sure the old parts are in good shape before you use them. Since you will repaint the closer you are repairing, used parts will not be noticed.

Repair all these old closers you have bought, if you can. Have them in first class working order and repaint them. Then when a customer brings in a closer to have it repaired, if you don't have the parts in stock to repair the closer, just swap one of the closers you have of your own. Give him a closer of the same size and preferably one of the same make. It will be impossible to tell them apart after repainting. You can explain this to the customer if you like. Tell him it is a rebuilt closer just like his, and by exchanging closers he will save time in waiting for you to repair his closer. You of course charge him a regular flat rate for rebuilding the closer.

Then order the parts and repair his closer, and put it in your reserve stock of closers ready to trade again. If your customer insists on his own closer, let him use your old closer until you get his repaired. Then trade back. This way he will not be without a closer while his is being repaired, and he will get the same closer back when you finish it.

After you have been repairing closers for a while you will accumulate large numbers of used spare parts and closers. Just build your business gradually. If you are in a small place and find it difficult to obtain old closers, buy a few different sizes of new closers and let your customer use your closer until his is ready. It will be much cheaper to do this than to try to start off with all parts for all closers.

By using the reserve closer system you can get by with having a small supply of essential parts on hand. When trading closers, you do not have to give the customer the same make of closer — but be sure it is the same size as his old one. It is best, of course to give him a closer of exactly the same size, make and model as his own closer, if possible. But you can usually get by nicely by just having a closer of the same size. So be sure to have a reserve of all six sizes of closers. It will be a life saver, and let you operate with a small stock of parts on hand. You can order parts as needed.

Of course you will want to add a large supply of parts as soon as you can build your business up, but by using the reserve closer method you can make your business pay its own way as you add parts gradually.

In this book it would not be practical to try to list all parts for all closers by description and part number. It would take too much space and would be confusing to the reader, especially the beginner. Besides, closer models are changed frequently.

Instead, I have attempted to teach you to recognize the parts of a closer so you can order parts easily. In the chapters describing various makes of closers, you will find illustrations showing each part, its position, and its name. You will also find a description of the function of each part, and how to take out all the parts and put them back again.

To order a part or a number of parts, always try to give the name of each part, the size of the closer, and the model of the closer. Read all the information stamped on the closer itself. Look at the name plate, the main arm, the cover, the end caps etc. to find model number, size, and make of closer. When ordering springs, be sure to state whether you want a helical or clock spring, and then give name, size, and model number of closer. It's that simple. With experience you will be able to recognize most closers by make, size and model at a glance.

At the end of this chapter you will find a list of the addresses of most of the popular closer factories. Many of you may already have suppliers who can furnish parts for you. Usually your hardware wholesaler can get them, since most factories prefer to sell parts and closers through authorized distributors. Perhaps your retail hardware dealer can obtain them if you live in a small place where there are no hardware wholesale dealers.

But if you have any difficulty in obtaining parts for any closer, write to the factory and ask them to tell you where to order parts. They will see that you get the name of your nearest distributor or dealer. They will also see that you get a complete parts list if you desire, for all model closers they make. Also a list of tools.

When writing to a factory or a dealer, try to use a letterhead with your name and address printed on it. At least enclose a printed business card. These are inexpensive and will show that you are engaged in the legitimate business of repairing closers. Some business places hesitate to answer letters not written on a business letterhead.

In case you need a part and know the name of the closer, but can't find the model number etc., it will only cost a few cents to mail the part so they can match it. Do this only in emergencies, since it causes extra work in filling your order.

It will be necessary to have on hand a variety of packing washers for all makes. These are very inexpensive.

Some shops use a special string soaked with graphite such as used in pumps and by steamfitters etc., instead of regular door closer packing washers, if they don't happen to have the proper size washers on hand. They wrap this hard type cord around the spindle and ram it down the same as ramming down packing washers. It takes a number of turns, of course, and must be wound carefully in order to make a tight packing to prevent leakage of hydraulic oil from the piston chamber up through the gland into the spring chamber. You may obtain this cord from plumbing, hardware or steamfitting supply houses.

Another emergency method is to take a packing washer which is too large and remove a small section of the ring with a knife. The ring will now be smaller, but there will be a cut place where the two ends meet and touch together. Since several washers are used, the cut places are placed in different positions as the washers are stacked, so that the cut places are never over each other. After ramming them down with the rammer and tightening the packing nut, a tight seal is formed. But it is always best to use the proper material when possible, and avoid substitutes.

You will need a supply of closer hydraulic oil. A number of closer manufacturers supply this special oil made for door closers. You can use one brand of oil in other makes of closers. Your parts dealer can obtain this oil for you. It comes in gallon cans, five gallon cans, or even in twenty-five gallon drums. For practice work a gallon or two is all right, but for regular work, you should have at least five gallons or more, depending of course, on the amount of work.

Closer oil has special ingredients to prevent evaporation, to prevent freezing, to seal pores, and to prevent corrosion. It also has the right consistency to give proper pressure.

Some repair men have substituted hydraulic jack oil in emergency. This comes in gallon cans, or more, and is sold by auto parts dealers.

I have known others to make their own closer fluid, using mineral oil and glycerine, obtained from drug supply houses, in gallon jugs. But to do a first class job, you should use regular door closer oil.

You will need a supply of springs for the popular closers, for often these break and nothing else is wrong with the closer. At first you could have a few of the middle size springs — B, C and D (2, 3 and 4), since these are the ones most in use.

To sum it up, you will need a supply of packing washers, springs, and door closer oil. Later you can add arms, cases and other parts, also a few valves.

This list contains the parts used in most standard surface type closers. When ordering give closer size, model, make, and give name and description of part wanted.

For closers with clock type springs:—

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|------------------|--------------------------------|
| 1. Arm and nut | 8. Packing washers, |
| 2. Ratchet | (Sometimes only an "O" ring). |
| 3. Cover | 9. Spindle or shaft |
| 4. Case or shell | 10. Piston, or rack and piston |
| 5. Clock spring | 11. End cap |
| 6. Packing gland | 12. Regulating valve |
| 7. Packing nut | |

For closers with helical coil springs:—

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|-------------------------------|---------------------------------|
| 1. Arm and nut | 9. Packing gland |
| 2. Ratchet | 10. Packing nut |
| 3. Cover | 11. Packing washers or "O" ring |
| 4. Case or shell | 12. Spindle or shaft |
| 5. Top spring plate or dog | 13. Piston or rack and piston |
| 6. Middle dog | 14. End cap |
| 7. Bottom spring plate or dog | 15. Regulating valve |
| 8. Spring, helical coil | |

Here is a list of some popular closers.

Make of closer, name of manufacturer and address
Yale—Yale & Towne Mfg. Co., Lock & Hardware Div., White Plains, N. Y.
Corbin—P. & F. Corbin Div., American Hardware Corp., New Britain, Conn.
Russwin—Russell & Erwin Division, American Hardware Corp., New Britain, Conn.